Modeling Livestock Stabilization

Agriculture Canada

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86-03914/

Modeling Livestock Stabilization

Proceedings of the Workshop on
Modeling Livestock Stabilization
Ottawa, June 20-21, 1985

Editors

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1986

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Acknowledgment

An organizing committee consisting of John B. Penson jr. of Texas A & M University, College Station, Texas, Larry B. Martin of the University of Guelph, Guelph, Ontario, Stanley R. Johnson of the University of Iowa, Ames, Iowa, and Charles Gracey of the Canadian Cattlemen's Association, Toronto, Ontario, provided valuable direction during the planning stages of the workshop. H. Bruce Huff, Sean B. Chin, Robert A. Anderson and Jack A. Gellner of Agriculture Canada also provided valuable assistance in planning for the Conference. Zuhair A. Hassan of Agriculture Canada provided extremely valuable advice and assistance on all aspects of the workshop from initial plans through to publication of the proceedings.

Reviews of Workshop papers by Jack Selody of the Bank of Canada, Michelle Veeman of the University of Alberta, by Karl Meilke of the University of Guelph, and by H. Bruce Huff, Donald McClatchy, Roger Eyvindson and Eric Johannsen of Agriculture Canada were appreciated.

Special thanks are due to Andy Trempe and Tina Bow for assisting at the Workshop and for their diligent work in supervising the typing, printing and distribution of this publication. Also, thanks are due to Jean-Claude Drapeau for his cooperation in editing the papers, to Bob Lyle for his careful work in editing the publication, to Rhéal Lafrance for drawing charts and to Bev Adams for graphics work. Staff in the Electronic Typesetting Unit, Barb Wootton, Shelley Lafave, Joanne Bélanger and Barbara Ladouceur deserve special mention.

Merritt Cluff
Chairman
Organizing Committee

Foreword

This publication contains papers and review comments that were presented at the Workshop on Modeling Livestock Stabilization held in Ottawa on June 20-21, 1985. This workshop was sponsored by the Commodity Markets Analysis Division, Marketing and Economics Branch, Agriculture Canada. Representatives from Canadian and American universities, Canadian industry, the United States Department of Agriculture, provincial governments and Agriculture Canada participated in the workshop.

The principal objective of the workshop was to assess the abilities of existing livestock models in both Canada and the United States to handle the assessment of stabilization programs and in particular to identify priorities for future research.

The quantitative evaluation of programs is fundamental to policy development and operation. Models have a distinct role to play in the process of evaluation, and consequently the identifiction of their strengths and weaknesses is critical to their effective use as analytical tools. The publication of these proceedings will hopefully provide useful information for those interested in stabilization programs and in the abilities of existing models to assess the issues raised by the application of these programs to the livestock sector.

H. Bruce Huff
Director
Commodity Markets Analysis Division

Introduction

Uncertainty and low farm incomes in the red meat sector in Canada has been a central economic issue and the subject of intense policy debates among federal and provincial governments and producers during the past decade. Production cycles for livestock have become distorted as producers respond not only to livestock prices but also to a much more diverse set of economic signals. The markets of the 1980s introduced new factors creating instability such as volatility in exchange rates, rapid changes in consumer disposable income and dietary habits, quota reductions on milk production in North America and the European Economic Community (EEC), EEC meat export policies, grain price variations, escalation of interest costs and adjustments in herd size in North America and Australia. These new factors affecting prices and marketings, combined with the magnitude of the red meat sector in Canada and the need to restrain the increasing government deficits, forced a reconsideration of previous approaches to producer stabilization programs.

Stabilization for a long time has been a fundamental objective of agricultural policy in Canada. Instability in livestock markets, however, was not a critical problem until the early 1970s. Since that time, the Agriculture Stabilization Act was revised in 1975 to increase support levels and to introduce producer costs, and a new tripartite Red Meat Stabilization Program was developed, sponsored by producers, provincial governments and the federal government. Several provincial governments also provided support programs, a Meat Import Act was enacted and several short-term trade restraints were introduced between Canada and the United States, all of which were designed to stabilize livestock producers' incomes in the two countries.

The volatility of the red meat markets and the complexity of the production-marketing system, its interrelationship with other sectors and increased international linkages created difficulties in the development of effective stabilization programs and in the

analysis of their impact on prices, production, trade, farm structure, debt structure and so on. Any assessment of stabilization policies must include full consideration of these complexities to ensure that effective stabilization programs are developed. It is therefore important that consideration of the various linkages and feedback effects embodied in economic models be part of stabilization program evaluation for red meats. The detailed calculations embodied in these evaluations necessitate the use of quantitative tools.

Content organization

The workshop included three framework studies (papers 1-3) and four empirical studies (papers 4-7). The first paper by Gilmour and Cluff outlines the history of the stabilization program and raises a number of the policy and modeling issues for further research in the red meat stabilization. These issues include the nature of welfare gains, the impact on resource allocation and the role of government.

The paper by Choi and Johnson provides a comprehensive review of stabilization theory and the policy implications on the distribution of benefits (between producers and consumers) under various assumptions about markets, participants and market information available. They conclude that producers' welfare and production efficiency can be improved if stabilization policy is designed to take into account information regarding producer decision making, the production environment, demand structure and marketing institutions. They also note that stabilization programs can generate additional supplies depending on the level of risk adversity of producers. In many cases, little information is available to assist in program design and more research is required to generate appropriate data.

The paper by Shiau describes the short- and longer-term economic environment for red meats in North America. He estimates that, before the end of the 1980s, poultry consumption may exceed that of beef and pork, as both of the latter may trend downward. Lower feed costs and slow growth in consumer incomes favor poultry.

Cluff and Charlebois use the Food and Agricultural Regional Model (FARM) to assess the impact of various types of stabilization programs on the beef and pork industries. An important conclusion is the extent of linkages among the market levels and regions for beef. Their results indicate that the "trickle down" effect (that is, the benefits from one market level accrue to a lower level) from the slaughter cattle sector is substantial for the cow-calf producers, that stabilization programs would influence the level of trade, that consumers in Canada obtain limited benefits, and that program costs can be greatly influenced by macroeconomic policy.

The paper by Stillman outlines the structure of the USDA's quarterly forecasting model. From this analysis, the author proposes that declining family median incomes may be a cause of reduced beef demand during the 1980s.

The paper by Martin and Meilke provides an empirical assessment of the price, supply and U.S.–Canada trade aspects of stabilization programs for hogs and beef. They note that there is a larger impact and a lower cost for the slaughter cattle program than for a cow-calf stabilization program, as measured by the growth of the breeding herd and of trade. However, they note that even the slaughter cattle program does not have much of an impact; even the richest programs evaluated only increased trade by less than 0.1% of U.S. consumption.

Penson and Romain demonstrate the impact of macroeconomic policy on the agricultural sector through the use of the commodity-specific general equilibrium model of U.S. economy (COMGEM). They conclude that agricultural net incomes and real asset values in the United States are substantially higher when U.S. economic policy involves a low government deficit and moderate monetary growth. The policy of high deficit and slow economic growth of the early 1980s has had a strong negative impact on incomes in the agricultural sector but little impact on production. Thus agricultural stabilization policy should also consider returns to equity capital so as to reduce risks to highly leveraged producers.

In the discussion at the workshop, it was emphasized that the design, evaluation and operation of stabilization programs required good information on commodity markets and on producer and consumer characteristics. For modelers, providing ranges of impacts through sensitivity tests may be useful information to decision makers, even though relationships cannot be estimated (accurately).

The address by Gracey provides the cattle producer's view of stabilization policy. Gracey raises a number of issues regarding stabilization programs that confront producers. He emphasizes that national programs which retain regional comparative advantage are highly desirable features of any program. For producers, stability in policy is equally important as stability in the marketplace.

There was agreement by participants that stabilization program objectives need to be precise and measurable. Having clear concepts of what factor was to be stabilized was a recurring theme throughout the workshop. Client satisfaction and political acceptability are also important considerations for stabilization programs. It was also emphasized that modelers need to be aware that stabilization

programs are not static but evolve as commodity market or farm income change. Thus the policy parameters should be endogenous to reflect these modifications over time.

At the workshop, there were a number of areas identified for further research. One of the areas of highest priority was new research to estimate the changes in producer response to prices (including program benefits) under stabilization programs. Without this information, it is difficult to accurately assess the impact of the program. Another important issue was related to a better understanding of the distributional effects of stabilization programs according to the type and location of producers. Most of the stabilization analysis has been carried out at the industry or regional level; however, individual producer (micro level) responses and impacts appear to be increasingly useful information to decision makers. Better assessment of intercommodity impact of stabilization programs would also be beneficial. Further work on the links between stabilization policy impacts in the nonfarm sector and those in the farming sector may show that these macroeconomic programs are much more important than those in agriculture. Information on the impact of stabilization on industry growth may assist in deciding upon the trade-offs in public expenditures among growth-oriented versus stabilization-oriented programs.

H. Bruce Huff
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Part I

Framework

1

Modeling the Red Meat Sector: The Stabilization Debate and Canadian Stabilization Initiatives

*Brad Gilmour and Merritt Cluff**

Income protection and price support programs have been important components of Canadian agricultural policy over the past three decades. Stabilization schemes have been instituted by producer groups and governments alike in an effort to reduce perceived adverse welfare effects of instability in markets of concern. Recently, Canadian stabilization initiatives in the red meat industries have been undergoing some review and alteration and this process has raised some issues which require investigation through empirical research. The ability of existing models to address these issues is the principal focus of the current workshop.

In this paper, our principle objective is to provide some background discussion concerning the stabilization literature and its relationship with stabilization issues in Canada. Specifically, we identify several practical and theoretical stabilization policy issues and problems that require empirical and measurement. In so doing, we hope to place the proceedings from this workshop in perspective.

In the next section, we provide an overview of the theoretical literature as it pertains to stabilization efforts in the red meat industries. Following this, the Canadian experience with stabi-

* Brad Gilmour and Merritt Cluff are Agricultural Economists, Marketing and Economics Branch, Agriculture Canada, Ottawa. Thanks are extended to Sean Chin, Roger Eyvindson, H. Bruce Huff, Donald McClatchy and Gerry Robertson for their valuable criticism on earlier drafts of this paper. Errors and omissions, however, remain the responsibility of the authors. Views expressed in this paper reflect those of the authors and do not necessarily reflect those of Agriculture Canada.

lization plans is reviewed, placing an emphasis on the philosophies, pressures and relationships which have led to the evolution of Canadian stabilization initiatives. Finally, we identify some of the principle areas in which we feel work is needed.

Stabilization debate[1]

Throughout the agricultural economic literature, reference has been made to the instability that is inherent to most agricultural commodity markets. Although the consequences of instability in agricultural commodity markets are not entirely agreed upon, there is a general recognition that instability does influence farmers' production decisions.

The stabilization debate has focused primarily on the elements of production and market risk, uncertainty and instability and on the impact of these phenomena on participants in commodity markets. The discussion in the theoretical literature has primarily centered on the following three issues.

- Are there welfare gains from stabilization and what is the distribution of welfare gains and costs of stabilization between producers and consumers?
- How does stabilization affect the allocation of resources and production levels?
- Is there a case for government intervention to stabilize the market?

Welfare gains and their distribution

Massell (1969) integrates the propositions of earlier researchers, such as Waugh (1944) and Oi (1961), and provides a synthesis of the welfare effects of price stabilization schemes on producers and consumers. He demonstrates that whether price stabilization benefits one group or another depends upon the source (demand or supply) of the random price fluctuations. His analysis suggests that producers lose (gain) from price stabilization if the source of price instability is random shifts in demand (supply); consumers gain (lose) from price stabilization if the source of price instability is random shifts in demand (supply); when both demand and supply are random, the gains to each group are indeterminate and depend upon the relative sizes of the variances and upon the slopes of the demand and supply curves. The total gains from stabilization are always positive, with the gainers, in principle, being able to compensate the losers. Turnovsky (1974) notes that Massell's results depend on several critical factors concerning the way in

which instability is analyzed, such as the assumed functional form of the supply and demand relationships. Just et al. (1977) similarly demonstrate that Massell's results are not robust except under strict assumptions concerning the nature of supply and demand relationships. Turnovsky (1978) provides an excellent survey and overview of the evolution of the Waugh-Oi-Massell paradigm.

More recent studies have drawn on the pioneering work by Arrow (1964, 1965) and Debreu (1959) and have concentrated on the notion of "expected utility," recognizing the stochastic nature of prices, the risks associated with market outcomes and producers' attitudes to these risks. Newbery and Stiglitz (1981) address the issue of welfare gains from price stabilization in this context and conclude that, under most conditions, there are no net gains from price stabilization and that underlying assumptions and specifications are most critical in determining the incidence and distribution of benefits and costs of stabilization.

Recent work by Buccola and Subaei (1985) and Harrison (1982), under different circumstances, indicates that schemes employing aggregative analysis are unlikely to be the most effective stabilization mechanisms. They find "decision rules" based on aggregative analysis – for example, a national cost model – are unlikely to address the needs and concerns of all of their target clientele, unless the clientele is completely homogeneous. It is apparent that differing regional needs for stabilization must be balanced with the need to preserve regional comparative advantages for a federally sponsored scheme to be truly effective, yet be fair and equitable.

Resource allocation and production levels

It is unfortunate that the new analytical framework by Newbery and Stiglitz (1981) has not yet been successfully extended to industries possessing dynamic production processes, such as the red meat industries. The task of conducting analysis pertaining to stabilization in the red meat sector remains formidable. However, the analysis of storage activities represents an initial step in extending the framework to industries with dynamic production processes. In the competitive storage example, analysts are concerned with production processes where the producer has little control over the timing of output and it is the final output which is stored. However, in industries with dynamic processes, the timing of final output is subject to producer control, although the physical characteristics of outputs of differing vintages will vary (Jarvis, 1974).

It is arguable that producer response in industries with dynamic production processes is analogous to a speculative storage activity. Consequently, the effect will be identical in the intertemporal transfer of consumption from dates when low prices predominate to dates when high prices predominate. Hence, producers in industries with dynamic production processes are analagous to producers in the Scheinkman-Schechtman (1983) model undertaking both production and speculative storage. So, complicating the analysis is the fact that, instead of producing a homogenous output, producers produce a range of outputs of differing vintages, such that current output decisions affect future output possibilities (Jarvis, 1974; Reynolds and Gardiner, 1980).

Much of the theoretical discussion of producer decision making under conditions of uncertainty is based upon the premise that all producer decisions affecting production must be made *ex ante*. However, this type of caricature is not appropriate for red meat industries in which producers make decisions in a sequential manner and possess considerable *ex post* production flexibility. Turnovsky (1973) has observed that, under certain conditions, a risk averse firm possessing a sequential decision-making process and a degree of *ex post* production flexibility may well produce at a higher level than a risk neutral firm when faced with uncertainty. Consequently, it is possible that efforts to stabilize such an industry could result in a reduction in supply; conversely, the removal of stabilization programs may result in supply expansion.

Rausser and Hochman (1979) have indicated that dynamic programming techniques may be an enlightening tool for analyzing the problem in question because of the basic features that characterize the dynamic programming approach, which are consistent with the sequential decision-making process of red meat producers. First of all, the problem is divided into stages, with production or investment decisions required at each stage, much in the manner farmers make decisions to adjust their breeding inventories, vary the length of time they hold animals on feed (which affects carcass weights) and alter their decisions regarding whether they will sell their calves as feeders or fatten them themselves. Risks associated with these decisions at each stage are represented by assigning probabilities to the conceivable outcomes or states which could arise as a result of a particular decision. The effect of a decision at each stage is to transform the current state into a distribution of states associated with the next stage; this is a direct parallel to the manner in which farmers make decisions regarding breeding inventories. Finally, the solution procedure

begins by finding the optimal decision for each state of the last stage and working backward from there. Similarly, livestock farmers are forced by biological, capital and financial constraints to make decisions which will affect them well into the future; farmers must make decisions regarding where they wish their farm operation to be 10 years hence and then make current decisions consistent with the achievement of their established long-term goals.

Government intervention and the need for empirical exploration

Although the theoretical literature relevant to the stabilization debate is extensive, it provides anything but unambiguous results (Anderson et al., 1977; Newbery and Stiglitz, 1981). Many of the ambiguities that exist require extensive empirical exploration if they are to be resolved. Some of the critical issues which empiricists must strive to address and identify are:

- the shape of the firms' utility functions or, more specifically, the firms' attitude toward risk (aversion, neutrality, preference);
- the manner in which firms formulate their expectations;
- the nature of the supply and demand functions;
- the predominant source of instability and the form of the disturbance (multiplicative, additive);
- the nature of the decision-making process: Turnovsky (1973) has shown that, if the firm possesses a sequential decision-making process, it may make decisions which differ substantially from those that would occur if all decisions have to be made *ex ante*: this is one area in which livestock industries differ substantially from others.

If empirical models are to be used more extensively in policy analysis, the integrity of their theoretical foundations must be closely scrutinized. We must not become overawed with the process of econometric modeling to the extent that we are substituting the model-building process for a basic understanding of how markets are organized and how they function. The role of empirical modeling for policy analysis must be placed into perspective as a means to place greater precision on the parameters, which theory indicates are crucial to the successful design of policy, and/or as a means by which to discriminate among plausible theoretical formulations and conjectures. This second role is one that to date has gone relatively unnoticed in the stabilization literature, particularly as it pertains to the red meat industries. Theorists have forwarded a plethoria of explanations regarding how participants in a market make their decisions (for examples, see

Turnovsky, 1973; Pope, 1978, 1981; Newbery and Stiglitz, 1981; Scheinkman and Schechtman, 1983). Yet very few empiricists have made an effort to exploit the rigorous model selection/discrimination techniques now available to discriminate among alternative explanations (Cox, 1962; Davidson and MacKinnon, 1981; Pesaran and Deaton, 1978; Smith and Maddala, 1983).

Identifying and exploiting techniques with which to address these issues will provide challenges for empiricists for many years to come.

Canadian stabilization issues

Theory and policy

In moving from issues in the realm of economic theory to those in the applied economic policy domain, it always seems that one has to change gears, so to speak, and to travel on somewhat different and perhaps more rugged terrain. Stabilization programs in Canada have been introduced not only because of the perceived economic value of stabilizations, but also because of pressure from the farming community to provide income security and support. Consequently, the goals of stabilization policy have not been defined strictly in terms of economic criteria, and the evaluation of policy requires that this fact be recognized. For instance, in discussions of stabilization policy, the term "stabilization" has sometimes been used interchangeably with the provision of income support mechanisms, whereas in the economic literature no such definition is implied. The point is that, when evaluating policy from a quantitative perspective, empiricists must draw on economic theory, and also they must be cognizant of other objectives implied by the policy instruments selected and the ways in which these areas interact.

History

From a historical perspective, stabilization policy affecting the red meat sector in Canada goes back at least to 1944, with the enactment of the Agricultural Prices Support Act, which was designed to protect farmers from a postwar collapse of their markets. In 1958, the federal government passed the Agricultural Stabilization Act (ASA), which for the first time provided a specific formula for the stabilization/support of the farm prices of commodities. This act was amended in 1975 with a new support price formula. Since 1975, the history of red meat stabilization has

been marked by two basic phenomena. First, provincial governments developed stabilization programs to supplement the federal ASA, thus providing enhanced and often differential support in particular provinces. Second, two major attempts have been made to provide a national program for red meats in order to harmonize stabilization programs across the country. The most recent discussions have resulted in the Tripartite Red Meat Stabilization Proposal (TRMSP).

Stabilization programs in Canada have been characterized by the specification of formulae to determine support prices. In the original version of the ASA, an annual support price for "named" commodities was specified as equal to 80% of the previous 10-year average price. The 1975 revision continued the annual time frame, but reworked the formula to equal 90% of the previous 5-year average price, adjusted by the difference between current measured cash costs and its previous 5-year average. This formula was expected to be more sensitive to economic conditions. In fact, however, this formula never provided a payout (equal to the difference between the support price and the market price) for slaughter cattle from 1975 to 1984. Several payments were made for hogs, and one was made to cow-calf operators. In the latter case, coverage has not been "statutory" and the cow-calf sector has had to be "designated" for payment by the Minister of Agriculture in order for support to be provided. The reason for statutory (nondiscretionary) support for slaughter cattle operations and nonstatutory (discretionary) support for cow-calf operations was based on the expectation that payments made to slaughter cattle operators would trickle down to the (primary) cow-calf sector.

Dissatisfaction with existing ASA and increasingly costly provincial programs led to discussion of a new participatory, tripartite national program involving producers and the provincial and federal governments. In this case, the quarterly support price formula for slaughter cattle and hogs is based on a "guaranteed margin" approach in which the support price is equal to current cash costs plus a percentage of the historical 5-year average difference between prices and cash costs. The formula for the cow-calf sector is annual and is based on the percentage of the 10-year average real price of feeder calves. While these support prices provide an enhanced level of support in the sense of higher support prices, compared with ASA prices, the programs provide for producer participation in the form of levy payments. The combination of payments and levies comply more with the notion of "pure" stabilization, as opposed to simple price or income support,

which involves removing the low end of the price or income distribution.

Several characteristics of past federal stabilization programs as they relate to red meat commodities in Canada are useful to note. These provide evidence of the evolutionary process of policy, and reveal policy movements that could possibly be assessed quantitatively. These characteristics and the issues they raise can be summarized as follows.

- The focus of past Canadian stabilization policy for red meats has been on producer returns per unit, and programs in effect are deficiency payment type programs. This is distinct from both "pure" revenue stabilization and "pure" price stabilization per se. Furthermore, the stabilizing impact of Canadian programs is somewhat unbalanced, since the peaks of the price paths are left untouched; only the lower end of the price distribution has been truncated.
- Federal stabilization programs have been designed in such a way as to not distort long-term industry profitability trends. This design characteristic is evident in the base of support prices being calculated as a fraction of the averages of preceeding annual prices and costs. For instance, in the cases of both Agricultural Stabilization Act and the Tripartite Red Meat Stabilization Proposal (TRMSP), if prices fall and stay low, support prices will, after a period of time, also fall and stabilize at a level below the reduced market prices. This approach can be contrasted with certain provincial programs that isolate producers from market signals by basing support prices on full costs of production.
- Until recently, stabilization has been implemented primarily for the slaughter cattle and hog marketing sectors in the red meat industry. Benefits were assumed to be passed through to other stages of the production activity, such as the cow-calf and feeder pig sectors. Hence the "trickle down" view of the dispersion of the benefits of stabilization payments predominated. In contrast, the new RMSP negotiations led to a proposed stabilization program for each subsector in the production chain (feeder calves, backgrounders).
- In recent years, a major issue in stabilization has been the issue of equity among provinces. It has been postulated that the best way to preserve regional comparative advantage is to harmonize all payments, that is, to make equal payments to all producers of a product, regardless of the geographic region they are from. This aggregate approach certainly satisfies the stated and

implied objectives of support and equity in the ASA, although there is considerable debate as to whether such schemes provide the most effective stabilization mechanism for producers in different producing regions of the country (Buccola and Subaei, 1985; Harrison, 1982).

- The perceived role of government in stabilization has evolved significantly over time. Initially, stabilization programs were viewed as a "contractual" or statutory arrangement whereby government would intervene to reduce the hardship of producers under certain measured conditions (under ASA, the Minister of Agriculture did have the option to designate other commodities for stabilization in each year). Starting with newer provincial programs and the RMSP, stabilization has been viewed more as an insurance program, and producers have assumed more financial responsibility. Such a regime requires the establishment of a stabilization fund with "levy" contributions from participants in the plan. Hence, stabilization programs have become more like "pure" stabilization programs with producer income streams affected throughout the course of the commodity cycle. In addition, programs have become voluntary in nature and producers may choose not to participate.
- A final characteristic of stabilization plans in Canada has been their assumption that Canadian producers, at least in the red meat area, are price takers with domestic prices being exogenously determined by their American counterparts. That is, the assumption in making stabilization payments is that they do not cause lower prices to producers, either because they do not stimulate output or because such a minimal market share would not affect prices. Increasingly, however, both foreign and domestic interest groups have expressed concern regarding the resource allocation effects of stabilization plans as they impinge on producers' output response (and consequent effects on domestic market shares, prices and international trade). It is generally recognized that stabilization programs have been better understood by producers in recent years and that the formulae for calculating payouts are now more broadly understood. Consequently, it may no longer be the case that (for certain programs) producers are unable to take expected payments into account when making their production decisions. To counteract this development, policy makers considered the inclusion of measures within stabilization programs to limit supply response. For instance, the proposed red meat

stabilization program restricts payments to previous production levels and also to domestically consumed product.

Some challenges

The preceeding description of Canadian stabilization initiatives and their characteristics provide some indication of the issues for which quantitative analysis would be useful. A few of these issues are summarized in the passages which follow.[2]

Resource allocation and production response

What is the effect of stabilization payments made by government on the allocation of resources and on the level of output? How do the programs affect the production cycle? How is trade affected? To address these questions requires explicitly documenting the linkages between stabilization efforts, producer expectations and subsequent producer production decisions.

The effect of stabilization programs on output and resource allocation remains a critical issue. Payments made by government may be viewed as a subsidy by producers. A naive assessment would be that producers react to the payments as they would to a subsidy. However, other factors such as expectations and producer reaction to risk reduction also impinge on producer decisions. Empirical assessment of the importance of these factors is required if satisfactory answers to the question are to be found. Furthermore, an assessment of stabilization policy or the time distribution of production also requires the ability to track the dynamic aspects of supply response.

Distribution of benefits

What is the incidence of stabilization benefits among producers and consumers, both domestic and foreign? It may be difficult to measure the welfare gains directly attributable to stabilization. However, if the government finances stabilization, planners and policy makers must be able to identify who receives the benefits from such funding.

The incidence and distribution of stabilization payments and their associated benefits rests on the workings of the meat market. Obviously, with wholesale and retail prices largely determined in the United States (we are appealing to the small country assumption), it is clear that Canadian consumers would receive few direct benefits from stabilization. If output response is substantial in the Canadian setting, then output increases may simply affect

trade. In short, domestic consumers may not benefit substantially; rather, producers and to some extent, importing nations may benefit. In the U.S., on the other hand, the incidence of benefits largely rests on the elasticities of supply and demand. Clearly output response will affect prices in this case, and consumers would benefit directly. Information on these issues gives evidence regarding whether or not stabilization is in some sense a public good. If only one group benefits, the case for direct government involvement is somewhat diminished.

Program design: Horizontal and vertical implications

In terms of program design, what are the effects of stabilization at each point in the production chain upon the interdependence of the cow-calf and slaughter cattle sectors? What is the extent of "trickle down" effects? Once again, the correct identification of the producers' decision-making process is crucial if government programs are to be successful in dissipating the risk that farmers face. Another issue which is critical to program design is the appropriate segmentation of analysis and policy to relatively homogenous production regions.

Accurate quantitative analysis can provide information which can be critical to the design of successful, well-targeted programs. The design of formulae is one aspect of this issue. For example, in the case of ASA or the RMSP, how do different averaging formulae affect the timing of support levels vis-à-vis the output and price cycles? In addition, trickle down effects and the interdependence of subsectors are important considerations for program design. Given stabilization of one subsector, how does this affect the need for stabilization in the other subsectors? For example, it is readily observed that, when feeder cattle prices are positively correlated with the price of the slaughter cattle, a price stabilization scheme for slaughter cattle may actually result in less stable returns to feedlot operators.

To maintain a stable margin, feedlot operators desire that the correlation between their weighted input price and the price of their output (slaughter cattle) be 1. If other input prices are static, feedlot operators would wish that the correlation of the feeder calf price and the slaughter cattle price be the inverse of the feeder calves' share of total input costs; this will result in a correlation of 1 between the weighted input price and the price of output. The problem becomes more complex when other input prices exhibit some volatility. To illustrate this point, suppose that the cost of feeder calves make up one-half of total input costs and that the

correlation of the other input prices with the output price is –1. To satisfy the feedlot operator's preference for the correlation between the weighted input price and the price of output (slaughter cattle) to be 1, the feeder calf price must have a correlation with the output price of 3. It is apparent that the type of stability which cow-calf operators may see as desirable may be in conflict with that desired by feedlot operators. In light of this discussion, it is possible that stabilization schemes directed at feedlot operators only and motivated by the presumption of trickle down effects for cow-calf operators may not achieve their desired objectives for cow-calf operators (Quiggin, 1983).

In a slightly different vein, it is quite probable that the effect of market instability will differ among geographic regions. Since we assume that Canada is a small country with prices determined exogenously, the variance of the slaughter cattle price remains much the same over all locations. However, input prices may be localized to some extent. More importantly, the input mix varies from location to location. For example, corn is the most important feed grain in central Canada, whereas barley is the most important feed grain in western Canada; while the prices of these feeds have been closely related, there have been marked differences at certain times (1983-84 for example). Furthermore, production in eastern Canada is relatively more intensive in nature than that in western Canada. Consequently, the correlation between the output price and input prices may differ across Canada. This means that analysis and policy initiatives based on national aggregates may not reflect the needs and concerns of their target clientele (see Harrison, 1982; for a related discussion, see Buccola and Subaei, 1985). Consequently, analysts should conduct their research on the basis of relatively homogenous production zones.

Similarly, policy makers should be aware of the different production environments in which producers of various geographic locations find themselves, while attempting to preserve relative regional comparative advantages. Empiricists can play a leading role in garnering the information necessary for the design of policies which will reflect the stability concerns of producers in different geographic locations while preserving regional comparative advantage, in the sense that benefits from and contributions to stabilization programs are balanced in the intertemporal sense.

Time dimension: Stabilization at what frequency?

Another area which requires considerably more attention relates to the time dimension of stabilization policies. By definition, stabilization policy is concerned with the time paths of economic variables; a central concern is what frequencies need to be stabilized by policy. The original ASA formula used a 10-year average of prices as a support base, but this was found inadequate. The revised ASA and new proposals for red meat stabilization use 5-year averages (except for cow-calf operations, in which a 10-year deflated base has been proposed). The original ASA was annual, but newer proposals are for quarterly programs. These changes through time indicate a searching for the appropriate stabilization frequency that matches the need of producers.

Economists have been extremely dextrous in their efforts to suppress the time dimension of policies in their efforts to make problems analytically tractable. However, the use of more powerful analytical tools have now made the explicit treatment of the time dimension possible. This has a couple of important consequences. First, in a dynamic model, the researcher is concerned not only with the efficiency of specific equilibrium, but also with the efficiency of time-dated equilibrium and the efficiency of adjustment paths between equilibria. Using this framework, the price stabilization problem can be seen as a subset of the more general problem of the intertemporally efficient allocation of resources or, from a consumption perspective, maxmimizing the expected utility of lifetime consumption.

Second, if dynamics are introduced under conditions of uncertainty, the time paths of economic variables can be described by stochastic processes (Samuelson, 1969, 1971). A stochastic process can be represented in either the time domain or in the frequency domain. For many issues in stabilization theory, the frequency domain representation provides empiricists with the means with which to analyze the problem and to obtain the most enlightening results. It also focuses attention on a crucial, but often neglected, question; at what frequency of oscillations should stabilization policy be directed (BAE, 1984)? For instance, it may be useful to study the spectrum of producer price-cost margins to gain insight into the frequency and amplitude of oscillations.

Alternative sources of funding: Distributional problems revisited

What are the effects of alternative levels of producers participation? For instance, if producers fully funded the stabilization scheme

through a constant contribution (levy), how would the benefits and costs of stabilization be distributed?

At first blush, the financing issue of stabilization programs may appear to be a trivial issue. However, in the case where producers finance all the costs of stabilization, arguments concerning the incidence of benefits become critical because of free-rider problems. Presuming that stabilization is paid through "levy" contributions, at what level should these be set to maintain an actuarily sound program? An even more difficult question is that, given "trickle down" and other effects, should levy contributions not be paid in accordance with economic as opposed to nominal benefits? These issues give rise to the need to ascertain the effects of alternative financing arrangements. They also relate to the issue on the role of government alluded to earlier.

Concluding remarks

Models are tools, and it is important to understand their limitations and the areas in which they can be improved and amended to address the theoretical and practical issues which arise. We have tried to provide a motivation for the application of models to the study of beef stabilization policy, both from a theoretical and a pragmatic policy perspective. The challenge is to recognize critical weaknesses in model design and specification and to set out a research program accordingly.

- It is conceivable that stabilization initiatives based solely on aggregative analysis will not encompass the perceived needs and concerns of the majority of producers; research should be undertaken on a homogenous region basis to determine whether support payments made under an aggregative scheme do indeed stabilize the series of concern to producers.
- Linkages between stabilization initiatives, producer expectations and subsequent production decisions must be explicitly documented, if assessments of stabilization impacts are to be accurate.
- More consideration should be given to alternative time frequencies of economic variables.
- Interrelationships between the various levels in the marketing chain must be examined more closely.

Once again, we advocate for the extensive use of formal model discrimination techniques with which to discriminate among competing, plausible alternative specifications (Davidson and MacKinnon 1981; Judge et al., 1985; MacKinnon et al., 1983).

Notes

1 The reader is well advised to read the article by Choi and Johnson in this publication; they provide a broader, more detailed discussion of the theoretical stabilization debate. We have provided a briefer synthesis of this discussion, choosing instead to emphasize those parameters and conjectures which require empirical quantification and verification to facilitate enlightened policy formulation.

2 Once again, we would like to advocate for the extensive use of formal model discrimination techniques with which to discriminate among competing, plausible alternative specifications (see Judge et al., 1985, pp. 854-89, for an overview).

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2

Price Stabilization Theory: Issues for Red Meats in Canada

*E. Kwan Choi and Stanley R. Johnson**

Stabilization policies are designed to reduce price uncertainty and/or maintain a more predictable income or expenditure stream for producers and consumers. Benefits of stabilization policies have been evaluated at essentially two levels of abstraction. Initially, the work on stabilization policy emphasized producer and consumer surplus trade-offs. Do stabilized prices benefit producers or consumers? How do the benefits to producers or consumers depend on the origin of the instability and whether or not the production or consumption decisions are made *ex post*, *ex ante* or under mixed *ex post* and *ex ante* conditions? Results in each of these cases are relatively fully developed under producer risk neutrality. However, in the *ex ante* and mixed decision problems, there are less clear implications of stabilization policies if risk neutrality is relaxed.

A second track for the research on stabilization policy considers more directly the correspondence between firm or consumer and market level implications, which are the microfoundations of stabilization policy. With these theoretical developments, the previous conclusions on benefits of stabilization can be greatly sharpened. The major reason is that efficiency can be incorporated directly into evaluations of benefits and costs and their incidence. Problems of entry and of long- and short-run impacts of

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stabilization policy can be investigated by delineating more carefully the microfoundations of market-directed stabilization policies. These more structured results add to the information on stabilization policy and call into question selected interpretations of well-known findings on benefits and costs of stabilization policy. At the same time, close investigation of the microfoundations reveals as yet unresolved questions on stabilization policy, particularly in the *ex ante* and mixed cases.

Implications of the existing theory for stabilization policies for red meats are important, particularly for program design and evaluation. Most of the theory on stabilization policy has been developed with highly stylized models. How these results apply for red meats in Canada is an important question. Clearly, the long production period, substitution in demand for red and other meats, diversification potential for producers and other factors can significantly alter or blur the conclusions from stabilization theory. Policy makers can improve the design of stabilization programs by incorporating the special characteristics of the red meat market.

The objectives of this paper are twofold. First, the intent is to provide an overview of the results available on stabilization policy. The approach is to classify these results by the program design and the decision situation faced by producers: *ex post*, *ex ante*, and mixed. We concentrate on producers, since the focus of subsequent papers in this volume is on red meat stabilization policy. The risk aversion hypothesis is important for the *ex ante* and mixed situations. Furthermore, the firm/market correspondence is more difficult to achieve in these circumstances. For this reason, the emphasis in the summary is on the *ex ante* decision model. Finally, special characteristics of the red meat market in Canada are suggested. These characteristics are evaluated relative to the stabilization theory as a basis for indicating where care must be taken in overgeneralization and to suggest productive areas for empirical and theoretical research.

Ex post production model

The early work on stabilization policy developed results under the implicit assumption that production and consumption decisions are made after market price is known. We term this formulation the *ex post* production model. First, firm and market results from the theory are summarized; then major implications for stabilization policy are evaluated.

Theory

Consider the behavior of competitive firms who choose their output levels after the market price is known. Effects of price instability on individual agents were first considered by Waugh (1944). Assuming that consumers choose their consumption bundles *ex post* or after the market price is known, Waugh argues that price instability benefits consumers. Based on the notion that firms also choose their output levels after the market price is known, Oi (1961) develops a model of competitive firms with complete *ex post* output flexibility and demonstrates that expected profit is greater under price instability. Hence, price instability is shown also to benefit producers. Integrating the analyses of Oi and Waugh, Massell (1969) demonstrates that producer benefits from price instability or price stabilization depend on the source of the price instability. Specifically, if a costless buffer stock scheme is used, price stabilization harms or benefits producers or consumers according to whether the price instability originates from the demand or the supply side. In addition, Massell shows that net benefits of stabilization are positive.

Price instability affects expected profits of competitive firms in the short run. Thus, price instability induces entry or exit from the market in the long run. By considering the firm entry decision, the result of Oi and Massell can be extended to characterize long-run market equilibrium. These results incorporating microfoundations provide an improved basis for stabilization policy. Specifically, the stabilization agency should anticipate both short- and long-run market responses when designing program parameters.

The firm level analysis of competitive producers with *ex post* output flexibility has been further extended by Dreze and Gabszewicz (1967), Sheshinski and Dreze (1976), Lippman and McCall (1981), and Dreze and Sheshinski (1984). In these studies, random industry demand is assumed to have zero price elasticity.[1] At each realization of demand, market price is determined to equate output with the revealed level of random market demand. Consistent with the firm level analysis, competitive firms are assumed to have perfect information *ex post*, that is, they know the market clearing price at each realization of demand and they make their production decisions on the basis of the revealed market price.

With the assumption of producer risk neutrality, Sheshinski and Dreze (1976) have shown that long-run equilibrium is efficient at the market level, in the sense that expected industry cost is at a minimum when the industry includes an equilibrium number of firms. They further show, however, that long-run equilibrium

results in cost inefficiency at the firm level, since risk neutral firms with complete *ex post* output flexibility operate with excess capacity (on average) and expected average cost is higher than minimum average cost. Although risk neutral firms adjust their output levels along short-run supply curves in response to changes in revealed market prices, their expected output is less than the level of output that minimizes average cost.

Stabilization policy

Two important implications for price stabilization emerge from this market level analysis of competitive firms facing fluctuating prices. First, even if firms are risk neutral and have complete flexibility to adjust output levels in response to changes in demand, price stabilization can improve resource allocation. Although price flexibility together with *ex post* output adjustment will insure Pareto optimality at each realization of demand, the results of Sheshinski and Dreze (1976) suggest a case for price stabilization since, in the absence of government intervention, risk neutral firms operate with excess capacity on the average, thereby raising the expected average cost above the minimum average cost.[2] Thus, the first-best policy is to remove the source of the uncertainty, if this can be achieved at zero cost. However, it may be difficult for the government agency to manipulate or stabilize aggregate demands for commodities that fluctuate over a business cycle. If fine-tuning of demand stabilization cannot be accomplished, then price stabilization can be a second-best policy and a more practical means of achieving the ultimate goal of improving resource allocation.

Second, welfare analysis of price stabilization should focus on consumers unless serious factor immobility hampers the free entry of competitive firms. Massell (1969) shows that price stabilization harms or benefits producers in the short run according to whether the price instability originates from the demand side or the supply side. A more recent analysis of Turnovsky (1973) also addresses short-run producer welfare effects from price stabilization. However, in competitive markets, no stabilization policies can have permanent welfare effects on producers. They can only affect the welfare of existing producers in the short run.

For instances where the price instability is caused by demand uncertainty, price stabilization at the mean price level decreases the expected profits of the representative producer in the Sheshinski-Dreze model. Since entry/exit decisions of risk neutral competitive firms are guided by expected profits, the fall in expected profits resulting from price stabilization induces an

exodus of firms from the industry. The exit of firms continues until expected profits of the representative firm rise to zero. Hence, in competitive markets without entry barriers, price stabilization cannot have long-term welfare effects on competitive producers. Therefore, in welfare analysis of price stabilization policy, more emphasis should be given to consumers. In contrast to transient welfare effects on producers, price stabilization tends to have permanent impacts on consumers.

Ex ante production model

An alternative way to frame the firm decision problem requires output determination prior to knowing the market price. This decision problem is termed the *ex ante* production model. In this decision model, attitudes toward risk play an important role in obtaining firm and market level outcomes. In addition, closure of the market model is accomplished by imposing rational expectations.

Theory

Since the publications of Baron (1970) and Sandmo (1971), an extensive literature has developed concerning the behavior of competitive firms who make output decisions before the uncertain market price is revealed.[3] As Newbery and Stiglitz (1979, p. 800) warn, producers cannot generate a positively sloped random supply curve – it is vertical and predetermined in the absence of production uncertainty – since production decisions are made before the market-clearing price is established. Production decisions are based on (subjective) distributions of market-clearing prices and hence are predetermined, compared with the revealed market price.

The firm level analyses of Baron and Sandmo indicate that price uncertainty does not distort resource allocation, nor output, nor the expected profits of risk neutral competitive firms. Hence, price stabilization cannot improve resource allocation or the welfare of risk neutral competitive firms who make production decisions before the market price is established. However, Baron and Sandmo show that the introduction of price uncertainty reduces the output and welfare of risk averse competitive firms.

Specifically, the risk averse producers choose the level of output at which the expected market price equals marginal production cost plus the marginal risk premium (this sum can be called marginal full cost). They therefore produce less than risk neutral firms with identical production costs. However, this output reduction result

for risk averse producers holds only when a comparison is made between the output under price uncertainty and the output when mean price is observed with certainty. More restrictive assumptions are required to determine the effect of incremental or small increases in price uncertainty on the level of output for risk averse firms.

For risk averse firms who exhibit diminishing absolute risk aversion (a widely accepted hypothesis that risk premium declines with income or profits), Ishii (1977) shows that a small increase in price uncertainty reduces output levels of competitive firms. Lippman and McCall (1981) consider the effect of an increase in risk in the sense of Rothschild and Stiglitz (1970) (which subsumes as a special case the type of increase in risk considered by Sandmo and Ishii), but obtain an ambiguous output response even for firms exhibiting diminishing absolute risk aversion. It is important to note that the principal result of Baron (1970) and Sandmo – that competitive firms produce less under price uncertainty – holds for all risk averse producers, including those with constant or increasing absolute risk aversion. This *ex ante* production model has been partially extended to market level analysis by Pazner and Razin (1975), who show that, in long-run equilibrium, risk averse competitive firms operate with excess capacity.

Stabilization policy

Many of the results of the *ex ante* production model have applications to stabilization policy. The findings summarized below focus on welfare, capacity, and efficiency in models that have more developed microfoundations. First, from the analyses of Baron, Sandmo and Ishii, the incremental results of stabilization policy are in general indeterminate. The stabilization agency or the government usually consider conditioned policy rules and small changes in policy instruments, rather than questions of price stabilization or no stabilization. It is important to establish that small decreases in the dispersion of price distributions via price stabilization have positive output effects for a larger set of risk averse firms than the class exhibiting diminishing absolute risk aversion.

Second, by extending the arguments of Pazner and Razin, price stabilization can be shown to improve resource allocation of risk averse firms who make output decisions *ex ante* by eliminating their excess capacity. However, Choi and Johnson (1985a, p. 3) suggest that designing an efficient stabilization program is a difficult task and cannot be achieved without incorporating supply

response into the stabilization instruments. For example, Eeckhoudt and Hansen (1980, p. 1067) show that stabilizing the market price around its initial mean by using a minimum and maximum price bound increases the output of every risk averse producer. However, because of this very supply response, the government's attempt to stabilize market price around its initial mean is certain to fail. Choi and Johnson (1985b, p. 15) show that efficient stabilization policy should be based on market level analysis and that stabilizing the market price around marginal cost, rather than the initial expected market price, is efficient and can be achieved at zero expected cost to government.

Third, welfare analysis of the impact of price stabilization on risk averse producers without *ex post* output flexibility must be based on expected utility of profits (not expected profits). However, Choi and Johnson (1985a, p. 9) argue that competitive firms may differ in their attitudes toward risk and may have different utility functions. Since expected utility is unique only up to a positive linear transformation, interfirm comparisons of expected utilities are meaningless. A more appropriate measure of producer welfare under price uncertainty is certainty-equivalent profit, equal to expected profit less the implicit cost of risk bearing. Certainty-equivalent profits or incomes not only are invariant to a positive linear transformation of the utility function, but also permit interfirm comparisons and consistent aggregations.

Finally, this welfare analysis of price stabilization on producers is limited to the short run. In competitive markets with risk averse producers, entry/exit decisions are guided by the expected utility of profits or the certainty-equivalent income of the representative producer. Insofar as free entry is guaranteed, any stabilization policy that increases the certainty-equivalent profit of the representative producer induces entry of risk averse firms. Entry of competitive risk averse firms continues until the certainty-equivalent profit vanishes. Thus, long-run equilibrium in competitive markets with risk averse producers is characterized by zero certainty-equivalent profit. Expected profit becomes the return to risk taking or the implicit cost of risk bearing. A stabilization policy may have short-run welfare impacts on existing risk averse firms but, with free entry, cannot cause permanent welfare benefits or damages to the representative firm.

Rational expectations and *ex ante* production

Critical to many of the results on the *ex ante* production model is the concept of rational expectations. For this reason, rational expectations and market equilibrium are reviewed specifically. Baron (1970) and Sandmo (1971) require that the firm know the distribution of market clearing prices before making an output decision. Thus, firm output depends on the subjective distribution of market prices. For the market to be in equilibrium, the subjective distribution of each firm must be confirmed *ex post*. If the representative firm's initial price distribution – and its production decision – prove false, the firm will revise its price distribution and adjust output accordingly. Thus, Newbery and Stiglitz (1981) suggest that, for the market to be in (short-run) equilibrium, the firm must have rational expectations, that is, the initial price distribution must be equal to the actual price distribution. If the actual price distribution deviates from the initial subjective price distribution, firms will adjust output. Hence, the market will not be in equilibrium except when output adjustments of firms happen to cancel one another. Once firms have rational expectations, they need not adjust their output levels and hence the market will be in equilibrium.

However, it is not a simple task to verify rational expectations. For rational expectations to be workable, the firm must be able to tell whether its initial price distribution is equal to actual price distribution. But at the end of period when market demand is realized, the firm observes only a single market equilibrium price, not the full price distribution. If the firm were to confirm the market price distribution by this process, it would require many repeated experiments. Thus, an indirect method of verification is necessary, if the rational expectations hypothesis is to be tractable in the *ex ante* production model.

Choi and Johnson (1985a) resolve this problem by noting that each price distribution is derived from a known demand distribution and is conditional on industry output. They hypothesize that the firm uses its subjective estimate of industry output to derive a subjective conditional price distribution. Since there are many distributions with positive probabilities for the observed market price, the firm does not use the observed market price to confirm this subjective price distribution. Instead, the firm compares actual output and its initial subjective estimate of industry output. If they differ, the firm revises its market output estimate and the corresponding conditional price distribution.

Mixed *ex ante–ex post* production model

A third approach to competitive firm behavior under demand uncertainty has been explored by Turnovsky (1973) and Hartman (1976). In contrast to models of the competitive firm with either complete *ex post* output flexibility or no flexibility, Turnovsky suggests that the competitive firm has partial *ex post* output flexibility in response to changes in market demand. In this model, total production cost depends on *ex ante* planned output and *ex post* output adjustment. Adjusting output *ex post* is costlier than altering output *ex ante*. Unfortunately, implications of partial *ex post* flexibility on firm output and producer welfare are ambiguous even in the risk neutral case.

Hartman presents a more tractable model of competitive firms with price uncertainty. Plant (herd) size or the capital input is fixed in the short run and hence must be determined *ex ante*, based on a subjective distribution of market-clearing prices. However, the quantity of the variable input, say labor (feed), can be adjusted in response to changes in the revealed market price. The variable input and output are chosen to equate the market price to marginal cost. *Ex ante*, alteration of the capital stock changes the level of fixed costs and shifts the short-run marginal cost curves.

Hartman shows that the effect of price uncertainty on the size of the capital stock is indeterminate but provides in addition a condition under which risk neutral firms will choose a larger capital stock with price uncertainty. Unfortunately, this condition lacks intuitive interpretation, and hence more research is needed to determine effects of price uncertainty on the level of capital stock. Furthermore, extension of Hartman's analysis of competitive firms with partial *ex post* output flexibility to the market level is also necessary if efficient stabilization policies for such markets are to be developed.

Consumer welfare and price stabilization

Our review has to this point concentrated on producer implications of stabilization. Interestingly, the first of the modern works on stabilization by Waugh (1944) analyzes the problem from the demand side. Although most of the subsequent analyses have addressed the producer and supply response, there are important results for stabilization policy that follow from a parallel analysis of the consumer decision problem.

Using consumer surplus areas and the implicit assumption of zero income effects and constancy of marginal utility of income, Waugh demonstrates that consumers benefit from price instability. Extending the analyses of Waugh and of Oi (1961), Massell (1969) shows that, given the aforementioned assumption, price stabilization harms or benefits consumers according to whether the price instability originates from the supply side or the demand side of the market. Furthermore, price stabilization policies can yield net social benefits, defined as the sum of producer and consumer surpluses.

It should be noted that Waugh is considering the positive welfare benefits to consumers of instability in equilibrium market prices, resulting from random shifts of supply. Similarly, Oi is concerned with positive welfare effects to producers of unstable but market-clearing prices generated by random disturbances in market demand. Samuelson (1972) in an attempt to "kill two false birds with the same analytical stone" argues that manufacturing fluctuations of (disequilibrium) prices cannot improve social welfare. The "General Overcompensated Theorem" of Samuelson uses revealed preference theory to prove that price instability will indeed improve consumer welfare but argues that such price instability is not feasible. In Samuelson's model, the (disequilibrium) price fluctuates around the equilibrium level, with the underlying demand and supply curves held constant. A problem with Samuelson's result is that instability of market equilibrium prices is indeed feasible when the underlying market demand and supply curves are affected by the random disturbances, as explained by Massell.

Although Oi's (1961) finding that (equilibrium) price instability increases the expected profit of competitive firms remains valid despite Samuelson's scathing but questionable attack, Waugh's result on instability and consumer welfare is not as robust. When the constancy of marginal utility of income with respect to price is relaxed, Waugh's result does not hold generally (Hanoch, 1974). Price instability benefits consumers if the indirect utility function is convex in prices. It is well known that the indirect utility function is quasi-convex and hence cannot be concave in prices (Hanoch, 1977). It follows that price stabilization does not always improve consumer welfare. However, despite the theoretical possibility to the contrary, empirical evidence tends to support the hypothesis that the indirect utility function is convex in prices, and Waugh's result is therefore likely to hold empirically (Turnovsky, 1978).

Turnovsky, Schalit and Schmitz (1980) have recently reexamined the conditions under which price stabilization benefits consumers. When only a single commodity price is stabilized, consumer benefits from price stabilization depend on four parameters: the income elasticity of demand, the price elasticity of demand, the budget share and relative risk aversion. Specifically, a sufficient condition for consumers to lose from price stabilization is that the Arrow-Pratt relative risk aversion measure be less than twice the income elasticity of the good in question. Using an empirical estimate of the income elasticity for food equal to 0.6, and a hypothetical value of unitary relative risk aversion, Turnovsky, Schalit and Schmitz argue that food price stabilization would harm consumers.

The abundant empirical data on food consumption provide reliable estimates for budget shares and the income and price elasticities of demand. However, the empirical evidence on the magnitude of relative risk aversion is scarce and conflicting. Recently, Choi and Menezes (1985) have developed a simple procedure to extract the exact value of relative risk aversion, if it is constant, and a lower bound for relative risk aversion, if it is not constant. They conclude that unitary relative risk aversion approximates risk neutrality and that, for most individuals, relative risk aversion far exceeds unity. This result, in conjunction with arguments of Turnovsky, Schalit and Schmitz, suggests a far broader latitude for stabilization authorities in setting policies that benefit consumers than is indicated by their simple empirical example.

Issues for red meat stabilization

In this section, we infer from the general theory of stabilization issues germane to the design and evaluation of red meat stabilization programs. In general, these issues relate to conditions in the red meat market and how these conditions may influence the applicability of the major results from the stabilization theory.

Producer attitudes toward risk

Analysis of the *ex ante* production model shows that, if firms are risk neutral, the introduction of price uncertainty does not affect resource allocation and producer welfare. This implies that price stabilization is redundant from the producer viewpoint (although it may be costly to the government). It is the producers in Canada that have promoted the red meat stabilization program.[4] Price

stabilization can be justified in markets where firms do not have *ex post* output flexibility only if firms are risk averse. Thus, benefits from the red meat stabilization program will depend critically on the degree of risk aversion of red meat producers. Most economists agree that producers are risk averse. However, establishing that red meat producers are risk averse is not sufficient to justify a costly stabilization program. The stabilization agency must additionally establish that the degree of risk aversion for producers as a basis for justifying large resource commitments to price stabilization.

A useful measure of producer risk aversion is the Arrow-Pratt risk premium. Various experiments can be conducted to determine the degree of risk aversion for red meat producers. However, policy makers need more concrete evidence of the cost of risk bearing to justify stabilization programs. The actual risk-bearing costs are not readily observable in the short run. However, the costs of risk bearing are observable and equal to expected profits in the long run. Thus, the question of how risk averse producers are can be answered by evaluating observed risk-bearing costs or expected profits in long-run equilibrium. The point is that empirical work on the costs of risk bearing is important as a foundation for stabilization policy.

Production characteristics

Pazner and Razin (1975) show that risk averse firms without *ex post* output flexibility operate with excess capacity in long-run equilibrium, whereas Sheshinski and Dreze (1976) demonstrate that even risk neutral firms operate with excess capacity on the average, if they choose their outputs after the market price is revealed. Thus, price stabilization theoretically can improve resource allocation of competitive firms, regardless of whether there is *ex post* output flexibility. The existence of excess capacity per se is not a sound justification for price stabilization. For instance, if price instability causes the representative producer to operate at one-half capacity, the number of firms can double to satisfy market demand.

A more important consideration for policy makers is the shape of the average cost curve of the representative firm. Many empirical cost studies indicate that average cost curves have a fairly wide "flat bottom." If red meat producers have average cost curves of this shape, price stabilization may eliminate excess capacity but may not significantly lower average production costs or prices to consumers. Alternatively, if the average cost curves of red meat

producers are V-shaped, elimination or reduction of excess capacity via price stabilization will reduce expected costs and expected prices to consumers. Thus, designing cost efficient stabilization programs requires careful study of the cost structure in the industry.

Futures market

In the red meat market, producers make output decisions *ex ante* and receive a random price at the end of the period. With futures markets, risk averse producers can spread their income risk by hedging. The existence of a futures market is strong evidence that red meat producers do not have complete *ex post* output flexibility, that is, they commit resources that at least partially determine the level of output before observing the market price. If firms had complete *ex post* flexibility, there would be no *raison d'être* for a futures market.

Danthine (1978), Feder, Just and Schmitz (1980), and Holthausen (1979) consider effects of a futures market on the behavior of competitive firms who make production decisions before the market price is known. They have shown that the competitive firm chooses the rate of output for which the known futures price equals the marginal production cost. Hence, output for the representative firm is independent of riskiness of the spot price distribution and the entrepreneur's attitude toward risk. On the surface, this "separation result" has very negative implications for the social value of commodity price stabilization programs.

If the expected spot price were equal to the futures price, then every risk averse producer would treat the futures price as the known market price. That is, producers would ignore the riskiness associated with the selling of outputs on the futures market. The "separation result" eliminates the need for commodity price stabilization for producers. In virtually every spot commodity market with a corresponding futures market, however, the representative producer is a partial hedger, selling part but not all of the output on the futures market.

The existence of partial hedging with uncertain spot demand implies that the expected spot price is higher than the known futures price. Thus, risk averse producers who use the known futures price in production decisions produce less than risk neutral firms who would choose an output level for which expected spot price equals marginal production cost. It follows that the "separation result" at the firm level cannot be extended to the market level. It can be shown that price stabilization policies can

improve resource allocation and producer welfare by incorporating supply response and rationality, even in the presence of a futures market.

Demand characteristics

Consumer demand for a commodity shifts in response to changes in the prices of related goods. For stabilization policy, the government does not need to be overly concerned with variations of prices of complements in consumption. It is difficult to identify goods that are complementary in consumption. Moreover, their effects on consumer demand for the product in question are likely to be weak, even when identified. For stabilization, the major concern should be with prices of substitute goods. The higher the substitutability, the more a change in the price of one good impacts on the demand for the substitute.

Hicks defines (net) substitutability using cross partial derivatives of compensated demand functions. However, since consumers are not compensated in the marketplace and since producers face uncompensated demand curves, gross substitutability (defined by cross partial derivatives of uncompensated demand function) is the more pertinent. It is well known that gross substitutability need not be symmetric, except when consumers have homothetic preferences. Thus, a 1% variation in the price of red meats may result in a larger variation in the demand for its substitute, say, poultry, than a 1% variation in the price of poultry on the demand for red meats. Thus the stabilization agency must identify the groups of commodities that are highly substitutable for red meats and coordinate with stabilization authorities for these other commodities, if the program is to have the anticipated result.

Stabilizing the price of a final good should reduce fluctuations in input prices in the long run. However, in the short run, benefits of stabilizing the final goods price are reflected in returns to fixed factors. Owners of variable factors may not benefit from final goods price stabilization. However, insofar as markets for final goods are competitive, a fluctuation in the price of a variable input can result in fluctuations in prices of all goods which use that input.

Oil is probably a good example of a variable input whose price fluctuations have given rise to worldwide concern. Over the last decade, the impact of oil price increases on the prices of numerous commodities that use oil as an input has been substantial. Stabilizing the prices of leading inputs should have chain effects on the prices of final goods. Thus, stabilizing the price of one input not only reduces the instability of factor income, but also decreases

fluctuations of prices of final goods and the incomes of final goods producers. For instance, spending on stabilizing the prices of primary commodities, such as agricultural commodities, is more effective than stabilizing the prices of final goods, such as industrial manufactures, in promoting the stability of the economy.

Conclusions

The red meat producer decision problem is of the *ex ante* or mixed type. That is, producers must make output level decisions prior to knowing the output price. According to the stabilization theory, the welfare of producers with *ex ante* decision problems can be improved by properly designed price stabilization policies. These policies can also assure that the production of red meats is efficient. However, the design and application of price stabilization policies for red meats that assure improved welfare and efficiency in proportion require detailed information about producers, the demand structure and the institutions affecting the market. Much of this information, likely because there is limited experience in operating red meat stabilization policy, is currently unavailable. Thus, in initiating a red meat stabilization policy, those responsible should recognize the research requirements necessary for positioning the policy to attain the desired results for consumers and producers.

Information critical to successful operation of price stabilization policies includes risk preferences of producers, the industry and producer cost structures, substitution relationships for red meats in market demand, opportunities for diversification and use of contingency markets by producers, and finally domestic and international market relationships. The latter information requirement points to a problem for price stabilization policy not discussed in our review. Clearly, stabilization policies must recognize that Canada cannot set international market prices for red meats. Generally, stabilizing prices at levels much different from average international prices can be quite costly.

One final and more subtle factor that will influence the effectiveness of the red meat stabilization policy concerns the supply response to be anticipated as a result of the more certain market prices. If producers are risk averse, there will be a greater supply in the stabilized market. In short, the more risk averse the producers, the greater will be the likely supply response to the reduction in uncertainty. This supply response of producers, if not anticipated in setting stabilization program parameters, can result in large surpluses and/or government costs of program operation.

Notes

1 Sheshinski and Dreze (1984) attempt to use a general demand function without imposing restrictions on the value of elasticity of market demand. They are concerned with the existence and uniqueness of quasi-stable market equilibrium.

2 When underlying conditions of supply and demand are variable, Samuelson (1972, p. 492) stresses that adaptive price flexibility, rather than price stability, is optimal.

3 See Leland (1972) for the theory of imperfectly competitive firms facing uncertain demand.

4 In reality, the red meat producers who have argued for stabilization are not promoting a "pure" stabilization program but a mixture of price stabilization and support. Thus, their pursuit of such a program need not be taken as conclusive evidence of their risk averse nature.

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3

Long-term Prospects for the U.S. Livestock Economy with a Special Emphasis on the Cattle Sector

*Allen Shiau**

Following the 1975-78 herd liquidation, North American cattle prices soared. Omaha choice steer prices rose approximately 29% for 2 years in a row, reaching U.S. $67.80/cwt in 1979. Following U.S. prices, Toronto A1-A2 slaughter steer prices posted impressive gains of 38.5% in 1978 and 29.5% in 1979 to finish at Can $81.10/cwt in 1979. Since then, cattle prices have remained stagnated, fluctuating around U.S. $65/cwt in Omaha and Can $80/cwt in Toronto without any upward trend even in nominal terms.

Sluggish cattle prices, combined with volatile feed costs, have put cattle producers in a very vulnerable position. This has served to heighten interest in beef stabilization policies. Since the cattle prices are largely determined in the U.S. market because of its dominating size, an understanding of prospects for the U.S. cattle sector is beneficial in assessing the proposed stabilization programs.

The objective of this paper is to provide an analysis of long-term prospects of the U.S. livestock economy with a special emphasis on the cattle sector. The paper is organized as follows. The next section presents the economic setting regarding corn prices (which will mainly be determined by the new U.S. Farm Bill), the macroeconomy, and consumer tastes and preferences. Then, prospects for poultry, hogs, and cattle will be analyzed. Finally, a summary and implications will be presented.

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Economic setting

The 1985 Farm Bill and feed prices

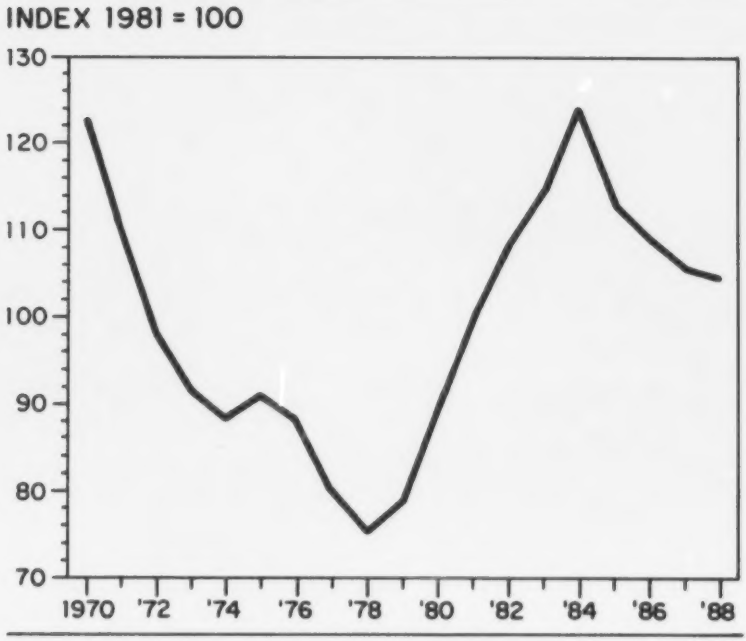
The 1981 Farm Bill was to expire by the end of the 1984-85 crop year. At this juncture, the U.S. government is in the process of formulating a new bill for the crop years from 1986-87 through 1989-90. The current excessive grain stocks are a result of the significant change in world grain markets and past farm bills, particularly the 1981 Farm Bill. At the time the 1981 Farm Bill was formulated, the main concern was that world needs would outpace production. Many economists as well as politicians believed that the agricultural policy issues of the 1980s were how to produce enough for a hungry world, how to stabilize the commodity markets, and how to ensure the United States remained a reliable supplier. At the same time, there was great concern over inflation and rising production costs. Thus, the 1981 Farm Bill was developed with a perception of high export growth and escalating production costs. The 1981 Farm Bill, which was finally signed into law, mandated higher minimum loan rates, continuation of income support through deficiency payments, and retention of the Farmer-Owned Reserve Program, which was misused as a price-support measure.

Now we are faced with different market conditions. Worldwide recession in the early 1980s, the high value of the dollar, burdensome levels of debt in many developing economies, and increased production in exporting and importing countries alike have combined to reduce U.S. exports.

The value of the U.S. dollar was declining against other currencies up to the end of the 1970s. However, from the second half of 1980 to mid-February 1984, the value of the U.S. dollar experienced a remarkable gain. The appreciation of the dollar during 1981 and 1982 can be attributed to the relative strength of the U.S. balance of payments, which was in surplus during 1980-82 and which led to a reduced availability of dollars in other countries, to the success of anti-inflationary policies, and to political unrest in many parts of the world. Since the second quarter of 1983, the U.S. balance of payments has turned from positive to negative. Despite the negative balance of payments, the value of the dollar continued to appreciate sharply during 1983 through the first half of 1985. This was mainly due to high interest rates, which are in turn caused by current and prospective huge U.S. budget deficits. In addition, growing confidence among foreign investors about the U.S. economy has also supported the value of the dollar. As shown

in Figure 3.1, the gain in the corn-trade-weighted value of the dollar is astonishing. The corn-trade-weighted value of the dollar adjusted by inflation (1981 = 100) jumped to 125.4 during 1983-84 from the low level of 76.0 registered in 1978-79. The dollar will depreciate against the firm currencies as foreign investors liquidate U.S. dollar assets, but the dollar will remain strong against the developing countries' currencies and limit the growth of world grain import demand.

FIGURE 3.1 TRADE-WEIGHTED VALUE OF THE U.S. DOLLAR: CORN



The rigid price-support levels and Farmer-Owned Reserve Program set in the 1981 bill have proven to be an ineffective policy tool to tackle the current problem. Since the root of the problem lies in the change in market demand, particularly foreign demand, policy intentions have shifted toward developing a market-oriented farm policy, allowing the market to determine prices and quantities.

However, with financial stress widely publicized, formulating a new farm policy has once again become a political issue – not just an economic one. From historical experience, economic issues have always been compromised with political concerns. Thus, we have assumed that the current policy measures of loan rates, target prices, Farmer-Owned Reserve and acreage reduction programs will be retained with some modifications.

Instead of setting an arbitrary minimum level and a small percentage that the U.S. Secretary of Agriculture can adjust, future loan rates will be tied to market conditions. In this forecast, we assume that future loan rates will be set at a ratio of 85% of the previous 3-year market price. Loan rates will not be used to establish a floor price to cover production costs (Table 3.1).

TABLE 3.1 ASSUMED FARM PROGRAM FACTORS, 1986-87 TO 1987-88

	Wheat	Corn[a]
Loan rate		
	(% of previous 3-year average)	
1985-86	107	112
1986-87	85	85
1987-88	85	85
	($/bu)	
1985-86	3.30	2.55
1986-87	2.86	2.35
1987-88	2.68	2.10
Target price		
	(% of previous 5-year average)	
1985-86	126	106
1986-87	120	102
1987-88	120	102
	($/bu)	
1985-86	4.38	3.03
1986-87	4.04	2.77
1987-88	3.79	2.52

[a] Sorghum, oats and barley percentages are set equal to corn percentages.

Source: Chase Econometrics

In the past, target prices were set at a minimum level in the first year the Farm Bill was implemented and then the Secretary was given discretion to establish higher levels in later years, based on changes in production costs. To ease current financial stress, the target price policy will be retained. However, to reduce federal outlay and unintended effects, target prices in the new Farm Bill will be reduced to 102% and 120% of previous market prices for corn and wheat, respectively, and will not be adjusted by the change in production expenses.

The reserve program seems to have been pushed beyond what it was initially intended to do; that is, to remove some of the inherent instability associated with agricultural commodities and to improve the U.S. reputation as a reliable supplier. Farmers had produced partially for the reserve rather than for the market. As a result, reserve carry-over stocks of corn increased from 185 million bushels in 1980-81 to 1.6 billion bushels in 1982-83, and wheat reserve stocks went from 360 million bushels in 1981-82 to 1.1 billion in 1982-83. While there may be some role for a public reserve to reduce instability, the future policy will put a cap on reserve entry.

The extent of movement in farm policy toward a market orientation will lower loan rates, allowing market prices to fall, and consequently will stimulate both domestic and export demand. In addition, some forms of commodity supply control and income support will be continued in the new bill.

With the foregoing assumptions, grain prices will plunge in 1986-87 and 1987-88. In 1987-88, the average farm prices of wheat and corn will drop to $2.82/bu and $2.24/bu, respectively, compared with the 1984-85 expected prices of $3.37/bu and $2.63/bu. Lower prices will stimulate more domestic consumption and exports. However, with little acreage idled in 1986-87 and 1987-88 and with farmers' desire to increase production to compensate for lower prices, grain stocks will continue to build up to a politically unacceptable level. Thus it is assumed that by 1988-89, although it may happen earlier, the U.S. administration will find it necessary to implement a relatively large acreage reduction program, with 20% to 30% of the acreage idled.

This acreage reduction combined with moderate expansion in domestic uses and exports will turn the real grain prices around. By 1989-90 real wheat, corn and soybean prices (deflated by GNP deflator) are expected to reach $1.28/bu, $1.11/bu and $2.44/bu, respectively, compared with the anticipated bottom in prices during 1987-88 of $1.07/bu, $0.84/bu and $1.89/bu. The anticipated

recovery in real prices by 1989-90 will be pale relative to expected 1984-85 real prices of $1.46/bu, $1.13/bu and $2.55/bu for wheat, corn and soybeans, respectively. Improvement in prices will encourage some acreage expansion, with 1990-91 total principal crops placed at 349.5 million acres (wheat 79.1 billion, corn 82.5 million and soybeans 73.3 million), up about 5 million acres from 1984-85 levels.

Macroeconomy

While some sectors, most notably housing, are on the upswing, the overall economic environment remains one of very slow growth, continuing the pattern that began early last summer. The evolution of the pattern of slow growth now under way has been as follows.

Extremely large and growing structural budget deficits, coupled with an only moderately accomodative monetary policy, have caused U.S. interest rates to remain extremely high relative to inflation and relative to interest rates overseas. These high real interest rates are having an increasingly adverse impact on the economy, since more of the pent-up demands which were created during the previous back-to-back recessions have been used up. So, housing activity remains well below the levels of earlier years, despite recent increases; spending on most consumer durables has stagnated, after surging earlier in the recovery; most companies have cut their desired inventory levels very dramatically, short-circuiting the normal inventory cycle; and expenditures for long-lived capital goods remain depressed. Most of these types of expenditures would normally be growing more rapidly at this stage of the business cycle.

Perhaps the biggest impact of high U.S. interest rates has been through its effect on the U.S. dollar. The enormously overvalued dollar on a relative cost or purchasing power basis has been by far the dominant factor behind the enormous increase in imports which is now displacing domestic output, thus causing a fall in utilization rates in a large and growing number of industries.

The restraining impact of the overvalued dollar on pricing in many industries, coupled with the sharp deceleration in productivity growth as the recovery has matured, has caused profits to weaken over the last 3 quarters. The softening in profits has been far more dramatic than had been anticipated and, coupled with the decline in operating rates, is causing many companies to scale back investment plans and to implement cutbacks in labor, wage freezes, and other cost-cutting measures.

The slowdown in employment growth, especially among high-wage manufacturing workers, and the slower growth in wages have caused a dramatic deceleration in the growth in real income during the last 12 months, even though inflation has remained relatively modest. Because changes in income are by far the most important factor determining consumer spending, the growth in real consumption during the last 12 months has thus fallen to 4.6% from the 5.1% increase in the prior 12-month period.

The net effect of these forces has been slower growth in most categories of final demand and more cautious inventory policies, which have combined to slow the rise in domestic demand, as well as an increase in the portion of demand being met by imports.

The near-term outlook for the economy is likely to remain sluggish during the next few months, but it will accelerate somewhat in the second half of the year in response to recent deadlines in interest rates. However, because the trade deficit is likely to continue to increase in response to previous strengthening of the dollar, the rebound in the second half will be fairly modest.

While a recession later in 1985 or in 1986 is possible, especially in view of the relatively slow underlying rate of economic growth, we at Chase Econometrics are of the view that an outright downturn will be avoided. This is based on the assumption that the Federal Reserve will continue to be as accommodative as necessary in order to avoid a recession, especially in view of the weakness in the industrial sector, the extremely low rate of inflation, and concerns about the health of the financial system. In addition, the downward trend in the U.S. dollar that we believe is now under way is likely to continue. Nonetheless, unless the U.S. federal budget deficit is reduced more sharply than is now expected, interest rates and/or the dollar will probably remain too high to promote very strong growth during all of 1986. Thus, a repeat of relatively modest and erratic growth in that year is likely.

During the next 10 years, continued deregulation, limited growth in social welfare programs and more incentives to work will combine to increase output. However, the GNP growth rate will be tempered by slow population growth, a relatively high rate of interest and a high value of the dollar, which will limit export growth. Prospects for major macroeconomic indicators are as follows.

Average annual growth rate of real output (GNP) during 1984 to 1994 is forecast at 2.9%, which is marginally higher than that of 1974-84 but lower than that experienced during the 1954-64 and 1964-74 periods.

The unemployment rate during the next 10 years will average below that of the previous decade, and will fall to below 6.0% by the end of the forecast period. Nevertheless, unemployment during 1984-94 at 6.6% will average above that for the 1954-64 and 1966-74 periods, in part because of the "structural" shift away from heavy industry and the labor displacement caused by that shift. A sharp deceleration in the growth of the labor force to 1.4% during the next 10 years, compared with 2.2% during 1974-84 will contribute to the drop in unemployment.

Per capita disposable income is expected to grow by an average of 1.8% per year during 1984-94, compared with the 2.7% and 2.2% registered during 1964-74 and 1974-84, respectively. The lower growth rate during the next 10 years is attributable to continued high rates of unemployment and to slower growth in government transfer payments to people.

U.S. inflation has been corrected sharply lower during the past 2 years. Slow economic growth rates and weak raw product prices around the world are expected to keep inflation in check during the next decade. Inflation as measured by GNP deflator is projected to average 4.6% per year during 1984-94.

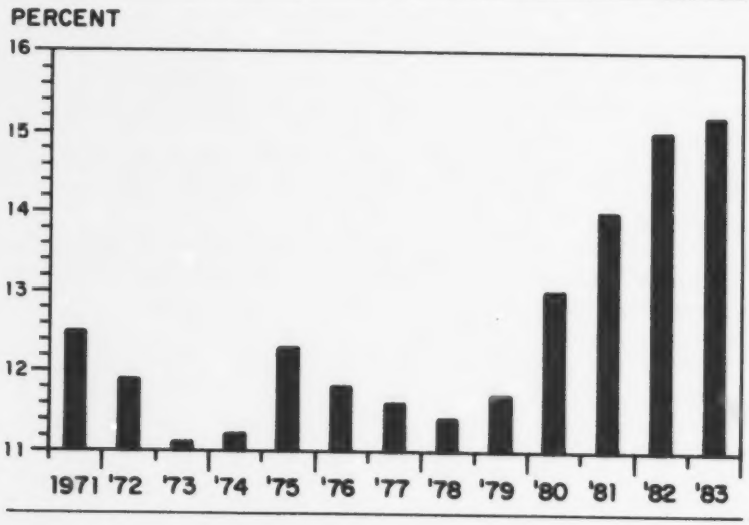
Moderate inflation coupled with continuing watchfulness of the Federal Reserve are expected to cause prime interest rates to decline. Prime interests are forecast to drop to 7.6% by 1994 from 12.0% experienced in 1984. Gradual improvement in federal deficits and deceleration in inflation expectation will result in a declining real interest rate from 8.2% in 1984 to 3.1% in 1994. Nevertheless, high real rates of interest during 1984-85 are expected to push the average of the period 1984-94 to 4.6%, which is marginally higher than the rate for the period 1974-84.

From the foregoing macroeconomic scenario, it is suggested that production costs for livestock producers will gradually decline as both inflation and interest rates trend down. However, strength on the demand side is expected to be rather limited. In fact, given the anticipated weak trend in disposable income, the demand for livestock products, particularly beef, may still be overestimated.

The six major sources of income are wages and salaries, proprietors' income, rental income, personal dividend income, personal interest income and transfer payments. Over the last few years, an increasing proportion of per capita income has resulted from interest payments and investment income. In 1970, interest income was 8% of total income. By 1982, interest income represented 14% of total income and 14.4% in 1984. On the other hand, wages and salaries, proprietors' income and transfer

payments accounted for 86% of income in 1970, but this was reduced to only 80% of income in 1982 and now accounts for only 78% of total income in 1984. Over the next 10 years, this source of personal income is expected to continue to represent a smaller share of income, declining to 76% of the total by 1992. A relatively large percentage of interest and dividend income is earned by a relatively small percentage of the population. Furthermore, a relatively small percentage of the increase in this income (marginal propensity to consume) will be spent on food. Thus, per capita disposable income is not a good measure of change in consumer demand for food. The growing disparity among different types of income can be further confirmed by looking at the poverty statistics (Figure 3.2). Despite the strong recovery in 1983, the poverty rate (the poverty threshold for a family of four was $10 178 in 1983 and $9 862 in 1982) edged up to 15.2% of the population on average, whereas it was just below 12% during the previous decade.

FIGURE 3.2 THE POVERTY RATE



While the poor performance of the economy appears to be the chief reason for growing income polarization in recent years, structural changes in the economy, most likely accelerated by recession and high interest rates, are also a factor. The most notable of these changes in the decline of many older

manufacturing industries and the rapid growth of the service sector. The economic and demographic forces acting to increase income inequality are likely to dominate during the decade ahead.

The shift toward service sector employment can be expected to continue and, along with it, the relative scarcity of jobs paying middle-income wages.

The declining proportion of wages and salaries from disposable income combined with the relatively high poverty rate suggest that the increase in demand for food, particularly beef, due to the improvement in income will be fairly limited.

Taste and preference

Consumer tastes and preferences have become one of the dominatant factors in the demand for meats as well as for the future potential of the beef industry. Despite its importance, the change in consumer tastes and preference cannot be easily quantified. Chavas (1983) finds that the price and income elasticities of beef has been decreasing in the last few years, while the income elasticity of poultry has been increasing. On the other hand, Moschini and Meilke's (1984) study suggests that the evidence of structural change is weak and that the recent decline in beef consumption may be attributed to changed market conditions and is thus of a reversible nature.

Despite these two contradictory findings, there is an increasing trend toward a more balanced diet and toward less fat and cholesterol intake. The phenomenon has been apparent through qualitative observation of the relative performance of red meats and poultry during the past 3 to 4 years. Poultry is no longer regarded as an "inferior" or "low-income" meat, and its high-quality cuts directly substitute for high-quality beef cuts.

The changes in taste and preference can also be unscientifically observed during business lunches and dinners, when prices and income are no longer a concern and when more people still choose salad chicken or seafood over steak. Chase Econometrics expects the trend toward favoring chicken to continue. Other than being equal, this will limit the price gain for beef product.

Prospect for the U.S. livestock sector

Broiler poultry

Broiler production has expanded year over year since 1974. Between 1973 and 1983, the annual growth rate in production was 5.4%, compared with –0.3% and 2.2% for beef and pork,

respectively. Technological advances in breeding, nutrition, housing, equipment, rearing, disease and production management have all contributed to reducing the cost of production. Productivity gains in production, processing and distribution have allowed poultry operators to continue to expand output, even with declining real poultry prices. Because of the biological nature, the almost immediate supply response to short-term profitability and resistance to cutting production when losses occurred resulted in an increasing market share.

We expect the broiler industry to capitalize the lower feed costs due to the changing Farm Bill and to increasing consumers taste and preferences. Broiler production is expected to reach 19.3 billion pounds by 1994, some 50% above the 1984 level and representing an annual growth rate of 4.1% over the level of the 1984-94 period.

Broiler prices on a 9-city weighted average are expected to range between 45¢/lb and 55¢/lb and to reach 64¢/lb by 1994, representing a growth rate of 2.4% on average during the 1984-94 period.

Hogs

Increased confinement feeding facilities and multiple farrowings dampened the hog cycle during the 1960s to such an extent that many agricultural economists felt that hog cycles may have gone out of existence. However, the sharp reduction of hog numbers in 1975 and 1982 shows that the hog cycle is still very much a part of agriculture. During the past cyclical variation, there existed a downward trend in per capita pork consumption. Hog industry prospects point to continuing cyclical variation in production in response to profitability, but no major expansion opportunities are expected. Hog production on a per capita basis is expected to trend lower over the decade.

At the present time, the hog industry is continuing to liquidate the herd. However, the continuing erosion of grain and oilseed prices over the coming months should allow for more profit opportunities and once again turn the hog cycle to gradual rebuilding. With expansion starting in 1986 and continuing through 1988, the hog population will peak at 61.1 million head in 1988 or 15.6% above the 1984 level. With that level of production and with some recovery in grain and oilseed prices by 1988, liquidation will once again begin and continue through 1990. At the next cycle bottom in 1990, the hog population is expected to decline to 51.5 million head or 16.3% below the 1988 peak. The herd will rebuild in 1991 as a result of improved profits, but peak at only 53.84 million head in 1993, since liquidation of the cattle herd

through this time period will also pressure hog inventory reduction. Therefore, during the next 10 years, the hog population will fluctuate cyclically around a downward trend.

In 1984, barrows and gilts at Omaha averaged $49.10/cwt; they are expected to average to $46.90/cwt in 1985, and will remain in this range through 1987 as hog production expands. With supply reductions of red meats in 1989 and 1990, hog prices will move upward, reaching $60.40/cwt in 1990. Reflecting liquidation between 1991 and 1992, hog prices will decline to the mid-$50/cwt level and then rise sharply with reduced slaughter in 1993 and 1994. By 1994, Omaha barrows and gilt prices in nominal terms are forecast at $68.80/cwt with an average growth rate of 3.6% per year between 1984 and 1994. However, in terms of real prices, hog prices will continue the downward trend that started in the early 1970s. Real hog prices deflated by the GNP deflator are expected to remain relatively flat between 1985 and 1994, ranging between $16/cwt and $20/cwt.

Cattle

The rapid liquidation of the cattle herd between 1975-78 resulted in very low per capita supplies, and cattle prices soared. As a result, the choice beef/corn price ratio rose, and a herd-rebuilding phase was initiated. Unfortunately, weak consumer demand resulting from the 1980-82 economic recession combined with record high interest rates and increased feed costs (as a result of the 1980 drought) halted the rebuilding phase, and liquidation continued. The 1983-84 run-up in feed grain prices, due to drought and the Payment-In-Kind Program in 1983, represented another setback to the still floundering cattle industry (Table 3.2). As a result of expensive feed, depleted feed grain stocks and weak cattle prices, the U.S. cattle herd declined by 0.4%, 1.0%, and 3.4%, respectively, with the January 1, 1985, cattle herd down to 109.8 million head.

Because of the poor profit prospect, cattle producers so far this year have not shown any intention of significantly rebuilding the cow herd. Lower feed costs during the next few years are expected to encourage placement of cattle on feed and also to reduce nongrain-fed slaughter. The decline in nongrain-fed slaughter will, for the most part, be offset by relatively high grain-fed slaughter. Consequently, total cattle slaughter will remain in the range of 36 to 37 million head. So far, the next couple of years the cattle population will continue to be depleted. Breeding herd rebuilding will be modest, and the total cattle population is not expected to increase until 1988. The population will increase gradually to a

TABLE 3.2 REAL U.S. GRAIN AND SOYBEAN PRICES, DEFLATED BY IMPLICIT GNP DEFLATOR, MAJOR PERIODS, 1973-74 TO 1994-95

	Wheat	Corn	Soybeans
	(U.S. dollars)		
1973-74 to 1976-77 (record high period)	2.94	2.05	4.78
1977-78 to 1982-83	1.88	1.39	3.55
1983-84 (year of PIK and drought)	1.61	1.45	3.50
1984-85 to 1985-86	1.42	1.09	2.49
1986-87 to 1987-88 (upcoming bottom)	1.09	0.90	2.08
1988-89 to 1990-91 (projected recovery)	1.22	1.04	2.29
Ten years forward	1.11	0.93	1.96

Source: Chase Econometrics

peak of 116.4 million head in 1991, compared with a previous peak of 132 million head in 1975. The relative magnitude of this "scaled back" industry growth is clear when one looks at cattle numbers on a per capita basis. The number of cattle for 1000 people is expected to fall to 466 head by 1991, down 36 head or 7.1% from the 1982 peak of 502 head per 1000. The projected number of cattle per 1000 people for the next peak, in 1991, is below all preceding cyclic peaks registered since the 1950s (Table 3.3).

TABLE 3.3 U.S. CATTLE POPULATION AT THE CYCLICAL PEAKS, 1955, 1965, 1975 AND 1991

	1955	1965	1975	1982	1991[a]
Total cattle herd (million)	96.6	109.0	132.0	115.4	116.6
U.S. civilian population (million)	162.8	191.5	213.7	230.1	250.2
Number of cattle per 1000 people	593.4	569.2	617.7	501.5	466.0
Change (%)	–	−4.1	8.5	−18.8	−7.1

[a] projection

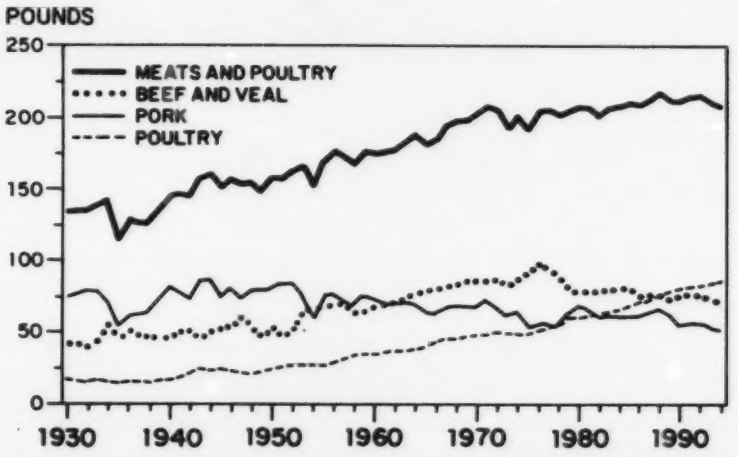
Source: Chase Econometrics

Between 1986 and 1988, a relatively high level of cattle slaughter combined with increased pork and poultry supplies will cause choice steer prices to remain stagnated in the range of U.S. $67-68/cwt. When beef supplies dip in 1989, choice prices are forecast to reach $73/cwt before declining slightly in 1990 and 1991. Cattle prices in real terms, deflated by GNP deflator, will continue to trend downward.

Summary and implications for the Canadian red meat stabilization program

During the next decade, U.S. livestock producers are likely to operate in the following economic settings. Feed costs will be lower as government implements a more market-oriented farm policy. A declining proportion of wages and salaries from disposable income, which is expected to grow only modestly, combined with a relatively high poverty rate, suggests that the increase in demand for beef will be fairly limited. Consumer tastes and preferences will likely continue to change toward favoring chicken. Consequently, per capita poultry consumption is expected to exceed per capita beef consumption on a retail weight basis by the late 1980s (Figure 3.3).

FIGURE 3.3 PER CAPITA CONSUMPTION TOTAL MEATS AND POULTRY, BEEF AND VEAL, PORK, AND POULTRY, RETAIL WEIGHT



To a large extent, Canadian livestock producers will operate within a similar environment, since both feed grain and red meat prices are mainly determined in the U.S. market. Canadian poultry sectors are regulated by various marketing agencies. Since prices to poultry producers are mainly determined by costs of production, lower feed costs will translate into lower poultry prices. Consequently, there will be a greater quantity demanded. Lower feed costs will therefore allow Canadian poultry marketing agencies to increase their quota allocation and to capture a larger share of consumer per capita total meat consumption.

Thus, while red meat stabilization is to give a stable production environment for Canadian cattle producers, the program design should not encourage overinvestment in the cattle industry. In addition, the program should not operate in a way that will transfer taxpayers' income to producers in the declining industry, since reduced consumer income would mean lower consumer demand. Given the nature of consumer demand and in view of changing consumer tastes and preferences, a greater return to the cattle producers might be achieved from expenditures directed to reducing fat and cholesterol levels in beef.

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Part II

Empirical Studies

4

Benefits of Stabilization Programs and Their Incidence: The Canadian Livestock Sector

*Pierre Charlebois and Merritt Cluff**

Canada's experience with stabilization policy dates back to the early 1940s. Formal (statutory) emphasis on stabilization began in 1958 when the federal Agricultural Stabilization Act (ASA) was passed. During the 1970s, the ASA was substantially revised, and provincial governments undertook local stabilization programs. In the last decade, two major attempts have been undertaken to secure an effective national stabilization program specifically for red meat commodities. Currently, legislation which would enable a new stabilization program involving the federal and provincial governments and producers is being discussed.

Against this background, there is a clear need to assess stabilization policy in terms of its economic effects on the livestock sector as well as on those sectors such as the consumer sector, the foreign sector and the government sector, which may also be affected. This need is motivated not only by concerns such as value for money, resource allocation and the benefit distribution of government funds, but also by issues such as the design characteristics of programs and possible negative consequences of programs that might be detected in advance of implementation. In any case, given the need for assessment and the nature of concerns,

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the process of evaluation will inevitably rely on quantitative tools to provide estimates that relate to the information requirements of the process.

It is to this area that the current paper is directed. Specifically, this paper reports the results of the application of a quarterly econometric model of the livestock sector in Canada to the study of recent proposals for a tripartite red meat stabilization program (Agriculture Canada, 1985). This paper does not purport to formally assess these proposals in an evaluative sense. In fact, no attempt has been made to model important details of the program. Rather it does attempt to examine the ability of the model to address important issues in stabilization policy and, perhaps more importantly, to identify deficiencies which may form the basis of future modeling research. Of course, in the process of using the model, several aspects of stabilization policy have been explored, which may now be of use in the policy assessment process.

This paper is divided into five further sections. The first section provides a brief overview of the livestock model, noting its general structure and characteristics. The next section outlines a baseline scenario, which comprises a 5-year historical period and a 5-year "forecast" period used as a benchmark for simulations. The following section describes the implementation and results of the application of the stabilization proposals to the model. In this section, some basic tentative findings concerning the benefits and the incidence of the stabilization proposals are presented; however, these findings need to be treated with extreme caution since they rely heavily on some basic, untested assumptions. The fourth section explores some alternative scenarios that enrich the understanding of the characteristics of the model, particularly how the stabilization programs respond to different situations. The last section offers conclusions in the form of lessons learned during the course of experimentation with the model either about the stabilization programs or, most importantly, about the model's ability to serve as tool for the assessment of these programs.

General overview of the model

For most of the past decade, economic modeling activity in the Marketing and Economics Branch of Agriculture Canada has focused on developing, maintaining and operating the Food and Agriculture Regional Model (FARM). A primary purpose of this large-scale econometric forecasting model is to provide input into the department's Outlook Program. However, component parts of FARM have often been adapted for use in policy evaluations,

market analyses, and initiating interdisciplinary research activities. A similar recourse was adopted for this workshop.

The model Agriculture Canada has used to analyze beef stabilization policy is essentially composed of the beef and pork components of FARM, with added detail designed to deal specifically with the stabilization issue (see Charlebois, forthcoming). In addition, there are some *ad hoc* equations which endogenize cash receipts and consumer surpluses of the red meat industry, Canadian feed grain and high protein meal prices, and which aggregate macro indicators such as the consumer price index (CPI) and the gross domestic product (GDP). The size of this model, called FARMSTAB, is 261 equations, of which 102 are behavioral stochastic equations and the remaining 159 are identities. Since in the model the red meat industries in eastern and western Canada each have their own structural representation embracing all three market levels – farm, wholesale and retail – the majority of the identities aggregate either the various live animal and final product categories or the regional results. Trade is specified at all levels in the marketing chain across regions as well as between each region and the United States, and between each region and the rest of the world excluding the U.S. Price expectations are based on simple lags of prices according to biological processes.

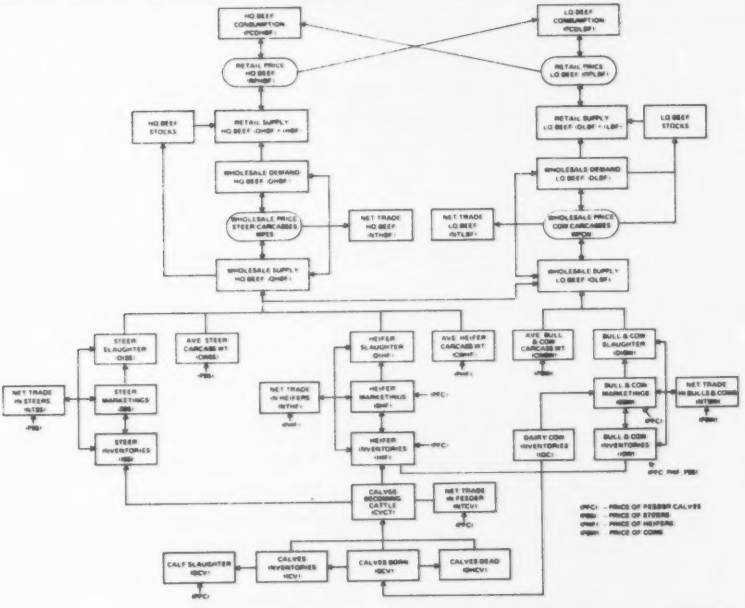
Components and structure

The beef component has 192 equations. Of this total, 161 equations either describe the fundamental behavioral relationships of demand, supply, inventories and price within the beef industry or serve as market closing identities and accounting tools; 12 equations estimate cash receipts; 17 equations calculate stabilization payments; and the remaining 2 equations calculate consumer surplus.

Three commodities are dealt with at the consumer level: high-quality inspected beef, low-quality inspected beef, and uninspected beef. Figure 4.1 presents a flow chart of the biological and economic relationships between the production of the first two commodities. Domestic demand for high-quality inspected beef in each region in the model must be met through either inventories, trade, interregional shipments or production. Production depends on steer and heifer slaughter, average carcass weights, and net trade and interregional shipments of live animals. Domestic demand for low-quality inspected beef in each region in the model is met in a manner similar to that for high-quality inspected beef. Production depends on cow and bull slaughter, the average cow and

bull carcass weight, net trade of bulls and cows with the U.S. and some proportion of dressed steer and heifer meat. It appears from the data that there has been no shipment of bulls and cows from western to eastern Canada since 1978. Domestic demand for uninspected beef is equated to uninspected cattle slaughter multiplied by the average cattle carcass weight.

FIGURE 4.1 BIOLOGICAL AND ECONOMIC RELATIONSHIP BETWEEN THE PRODUCTION OF HIGH- AND LOW-QUALITY BEEF



Marketings, slaughter, trade and inventories of various live animal categories are solved for at the farm level. Heifer and cow marketings are specified to be functions of opening inventories and the feeder calf price, since cow culling will increase as this price decreases. Steer marketings are just assumed to be seasonally adjusted percentages of opening inventories. Slaughter is equal to marketings minus net trade with the U.S. adjusted by shipments from western to eastern Canada. There are four types of animal

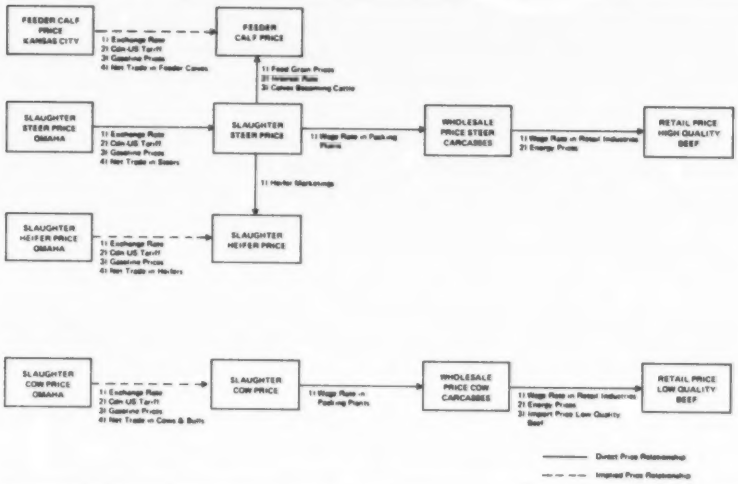
slaughter: calves, steers, heifers, and bulls and cows. Since slaughter is a derived demand for the production of high- and low-quality beef, it is theoretically a function of prices at all three levels in the marketing chain. Live animal shipments from western to eastern Canada and net trade of both regions with the U.S. depend on the price for the live animal in all three places, the Canada-U.S. exchange rate, the Canadian and U.S. tariff on slaughter cattle trade, and the retail prices of gasoline in both Canada and the U.S. When the retail price of gasoline in the U.S. increases, for example, it is more advantageous for Seattle to buy steers from nearby Calgary than from Omaha. As the estimated net trade of western Canada with U.S. increases in the model, shipments to eastern Canada decrease by a corresponding amount. Net trade of feeder is more advantageous for Seattle to buy steers from nearby Calgary than from Omaha. As the estimated net trade of western Canada with U.S. increases in the model, shipments to eastern Canada decrease by a corresponding amount. Net trade of feeder calves, feeder cattle, steers, heifers, and bulls and cows are endogenous to the component, and net trade of slaughter calves is exogenous.

Calves born, calves which die, and the inventories of cattle and calves in any period are for the most part predetermined by biological constraints from inventories in the preceding periods.

Steer prices are the focal points in both the horizontal and vertical price transmission equations in the component (Figure 4.2). While a direct relationship is specified between the Omaha and Toronto prices for steers in the model, one is not specified for cows, heifers and feeder calves. For these live animal categories, a change in the American price is passed through to the Canadian price via changes in net trade. American prices are exogenous to the model.

The price margin between the Toronto steer price and the Omaha price is a function of the exchange rate, the Canadian and U.S. tariff on cattle traded, the retail price of gasoline in both countries and net trade in steers between eastern Canada and the U.S. The price margin between Calgary and Toronto steer prices vary with West-to-East cattle shipments and the price of gasoline. The feeder calf price is positively related to the steer price, but negatively related to feed grain prices, interest rates and the number of calves becoming cattle. As mentioned above, because of trade between U.S. and Canada, there is some price arbitrage between the Kansas City price and the Canadian price.

FIGURE 4.2 VERTICAL AND HORIZONTAL PRICE TRANSMISSIONS IN FARMSTAB



In comparison with the beef component, the pork component is smaller in size but similar in structure. It consists of 56 equations: 42 either deal with the behavioral relationships of demand, supply, inventories and price in the pork industry or serve as market-closing identities and accounting tools; 6 estimate cash receipts; 7 calculate payments under the Agricultural Stabilization Act; and the last one calculates the consumer surplus of pork. Only one commodity is considered at the retail level: inspected pork. At the farm level, hog inventories are neither broken down by weight nor by breeding classification; however, eastern Canadian hog marketings are regionally disaggregated between Ontario, Quebec and the Atlantic provinces.

Empirical results

Despite the simultaneous nature of a large proportion of the model, ordinary least squares (OLS) chosen as the estimation technique because of its computational simplicity. This choice can be partially justified because studies have shown that the properties of OLS estimators, compared with those of other estimators in small

sizes, tend to be the least sensitive to problems such as multicollinearity, errors in variables and misspecifications.

The start date of the estimation range for the bulk of the equations in the pork component was the first quarter of 1970, and for the beef component it varied between the first quarter of 1966 and the first quarter of 1972. The common end date for all equations was the fourth quarter of 1983. All of the signs of the estimated parameters correspond with those anticipated by theory. Implied demand elasticities calculated at the mean are in Table 4.10.

TABLE 4.1 INTRA-SAMPLE SIMULATION PERFORMANCE: ROOT MEAN SQUARE PERCENTAGE ERRORS

Variables	Root mean square percentage error
Beef per capita disappearance, Canada	4.19
Pork per capita disappearance, Canada	3.72
Inspected beef production, Canada	4.39
Pork production, Canada	9.75
Slaughter steer price, Toronto	6.69
Slaughter cow price, Toronto	8.43
Hog price, Toronto	4.53
Feeder calf price, Calgary	18.72
Cattle marketings, Canada	10.82
Heifer marketings, Canada	19.42
Steer marketings, Canada	6.69
Bull and cow marketings, Canada	19.13
Bull and cow inventory, Canada	9.17
Calves becoming cattle, Canada	8.18
Hog marketings, western Canada	17.64
Hog marketings, eastern Canada	5.87

To test FARMSTAB's ability to duplicate historical data, an intra-sample simulation was carried out between the first quarter of 1972 and the fourth quarter of 1983. Summary performance statistics for representative variables are presented in Table 4.1. Root mean square percentage errors (RMSPCER) of 11 out of the 16 variables are less than 10%. The model appears to be weakest in reproducing the price of feeder calves in western Canada, heifer marketings, and bull and cow marketings. However, errors for these variables in recent periods (1980 to 1983) were substantially less than errors in the full period (RMSPCER at 8.3, 8.9 and 12.7, respectively).

The response of the model to sustained changes in key exogenous variables was investigated by calculating dynamic long-run multipliers. The model was shocked five times: for interest rates, the exchange rate, income and personal expenditures, U.S. prices, and Canadian grain prices. The dynamic multipliers are reported in Table 4.2.

The absence in the model of a variety of issues such as distinguishing between short keep, long keep and yearling fed steers, breaking down hog inventories by weight or for breeding purposes, packing capacity constraints and provincial stabiliation schemes, to name a few, may be noted. Although these questions ideally should be addressed, their absence stems from either incomplete or unreliable data and/or a desire not to further complicate an already very large and very complicated model.

With respect to the model's ability to deal with stabilization type programs and issues, see below under the heading "Modeling concerns."

Baseline scenario

To provide a base for comparison, this model was simulated from 1980 to 1989, using a specific set of exogenous assumptions. While some effort was spent making this baseline look reasonable, it should not in any sense be considered a forecast. In particular, some of the exogenous assumptions seem to be unrealistic, given recent data; in general, the assumptions provided in the terms of reference for the workshop were used, but certain assumptions were adjusted in light of recent evidence. However, to keep the assumptions reasonably consistent with those being used by other participants in this workshop, an effort was made to stay as close to those assumptions as was possible. Therefore, while this baseline provides a reasonable basis for comparison for the policy scenarios, it is not a forecast.

Assumptions

The major exogenous assumptions used in this baseline simulation are summarized in Table 4.3. The macro assumptions are largely based on forecasts provided by the Conference Board of Canada, and the U.S. assumptions are based on forecasts provided by the Missouri Valley Research Associates (MVRA). These two groups in turn have based their forecasts on those of the Wharton Econometric Forecasting Associates of the U.S. economy.

TABLE 4.2 MULTIPLIER-ELASTICITIES OF THE FARM LIVESTOCK MODEL[a]

Endogenous variables	U.S. prices		Income/ expenditure		Exchange rate		Grain prices		Interest rates	
	After 4Q	Long term	After 4Q	Long term	After 4Q	Long term	After 4Q	Long term	After 4Q	Long term
Cattle cash receipts	0.95	1.05	0.34	0.32	0.86	0.79	0.00	−0.02	0.00	0.00
Hog cash receipts	0.92	1.37	0.14	0.15	1.06	0.70	−0.01	−0.62	0.00	−0.04
Hog exports	0.44	1.45	−2.42	−0.52	17.92	5.88	−0.02	−1.33	−0.01	−0.03
Beef cattle inventory	0.03	0.37	0.02	0.08	0.02	0.25	−0.01	−0.11	−0.01	−0.06
Bull and beef cow inventory	0.04	0.28	0.01	0.05	0.03	0.20	−0.01	−0.07	0.00	−0.04
Cattle and calves inventory	0.02	0.23	0.01	0.04	0.02	0.15	−0.01	−0.06	−0.01	−0.03
Pig inventory	0.05	0.82	0.01	0.09	0.06	0.54	−0.02	−0.54	−0.04	−0.63
Beef net trade to U.S.	−0.07	0.93	−1.90	−1.20	2.06	3.96	0.05	−0.36	0.03	−0.06
Beef net trade to rest of world	−0.32	−1.02	0.45	0.59	0.92	1.22	−0.02	0.17	−0.01	0.04
Pork net trade to U.S.	7.16	9.35	−21.67	−3.74	5.37	5.26	−0.24	−7.92	−0.01	−0.46
Slaughter cattle, net trade to U.S.	−42.46	3.61	57.73	−3.07	−45.77	3.16	0.09	−0.75	0.04	−0.09
Slaughter cow price, Calgary	1.11	1.00			0.91	0.69	−0.01	0.08	−0.01	0.02
Beef per capita disappearance	−0.38	−0.27	0.36	0.48	−0.33	−0.17	0.00	0.00	0.00	0.00
Slaughter cow price, Toronto	1.08	0.90			0.88	0.63	−0.01	0.07	−0.01	0.02
Pork per capita disappearance	−0.13	−0.04	0.44	0.46	−0.16	−0.07	0.00	−0.09	0.00	−0.01
Feeder calf price, Calgary	0.87	0.87	0.21	0.18	0.82	0.66	−0.23	−0.28	−0.09	−0.09
Hog price	0.93	0.64	0.14	0.08	0.83	0.54	0.00	0.18	0.00	0.01
Slaughter steer price, Toronto	0.77	0.67	0.17	0.13	0.72	0.50	0.00	0.04	0.00	0.00
Inspected beef production	−0.35	−0.14	0.30	0.36	0.36	0.12	0.00	−0.01	0.00	−0.00
Beef CPI	0.89	0.58	0.22	0.12	0.76	0.41	0.00	0.04	0.00	0.00
Pork CPI	0.45	0.27	0.04	0.01	0.41	0.24	0.00	0.15	0.00	0.01
Bull and cow marketings	−0.27	0.10	−0.08	0.01	−0.24	0.05	0.04	−0.05	0.02	−0.04
Heifer marketings	−0.05	0.19	−0.01	0.02	−0.04	0.13	0.01	−0.05	0.00	0.00
Hog marketings	0.00	0.64	0.00	0.07	0.00	0.41	0.00	−0.74	0.00	−0.04
Steer marketings	0.01	0.22	0.00	0.03	0.01	0.16	0.02	−0.03	0.00	0.00

[a] The figures indicate the percentage change in the row variables in response to a one percentage change in the column variables. The response in certain trade variables appears very high due to their low levels in the simulation period, which was 1972 Q1 to 1983 Q4.

TABLE 4.3 ESTIMATES OF EXOGENOUS ASSUMPTIONS AND PERCENTAGE CHANGE FROM YEAR EARLIER

	1984	1985	1986	1987	1988	1989
Constant and personal expenditures	86 584	88 688	90 228	92 205	93 176	95 433
	3.4%	2.4%	1.7%	2.2%	1.1%	2.4%
Exchange rate	1.295	1.346	1.315	1.305	1.290	1.278
	5.1%	3.9%	-2.2%	-0.8%	-1.2%	-0.9%
GDP excluding agriculture	121 535	123 885	126 155	128 981	132 191	135 421
	5.0%	1.9%	1.8%	2.2%	2.5%	2.4%
Blended price oil	35.12	37.44	37.54	37.73	39.42	41.35
	1.3%	6.6%	0.3%	0.5%	4.5%	4.9%
Price of feeder steers, Kansas City	68.57	71.66	74.18	71.63	69.34	68.64
	-0.4%	4.5%	4.1%	-4.0%	-3.2%	-1.0%
Price of choice slaughter steers, Omaha	65.34	65.02	69.61	66.94	65.71	64.73
	4.5%	-0.5%	7.1%	-3.8%	-1.8%	1.5%
Price of barrows and gilts, 7 markets U.S.	48.86	47.50	50.01	45.46	49.50	51.52
	2.4%	-2.8%	5.3%	-9.1%	8.9%	4.1%
Prime lending rate	12.06	11.30	11.83	11.92	10.30	10.22
	8.0%	-6.3%	4.7%	0.7%	-13.6%	-0.7%
Wages in packing industry	433.42	432.46	441.87	462.90	486.03	519.55
	3.3%	-0.2%	2.2%	4.8%	5.0%	6.9%
CPI all items excluding food and energy	122.15	125.93	129.35	133.08	139.28	146.08
	3.8%	3.1%	2.7%	2.9%	4.7%	4.9%

Source: Conference Board of Canada and Missouri Valley Research Associates

GDP excluding agriculture is assumed to grow by about 2% a year over the 1985-89 period. The Canadian dollar is anticipated to gradually appreciate to about Can $1.28 per U.S. $1. Constant dollar personal expenditures are assumed to grow by a little less than 2% a year. The consumer price index for all items excluding food and energy is assumed to grow by about 3% a year from 1985 to 1989.

The U.S. livestock price assumptions provided by the MVRA for 1985 have been modified. The most extensive changes are applied to hogs. Originally, the MVRA expected increased hog profitability in 1985, which would stimulate production in 1986. The increased

hog profitability would be a result of lower corn prices and higher hog prices. In the baseline simulation, the hog price assumption is reduced from $51.50/cwt to $47.50/cwt. This lower price in 1985 has no impact on hog production in 1986 but, along with the help of increasing steer prices, raises hog prices in 1986. It is assumed that the hog sector will follow its normal cyclical price pattern and that it will drop severely in 1987. The unprofitable experience of 1987 cause is expected to decline in pork production in 1988 and 1989.

The exogenous assumptions concerning the beef sector rest on two propositions. The first proposition is that the bottom of the beef cycle will be reached in 1986. Herd rebuilding in that year will have a strong positive impact on steer price. The second proposition is that demand will not be strong enough between 1987 and 1989 to support price increases so long as production increases as a direct result of the profitability feeding conditions during 1984 and 1986.

Scenario description

Baseline simulation results for the beef sector are summarized in Table 4.4. According to the baseline simulation, the price of A1-A2 steers in Toronto rises by 2.1% in 1985, 3.9% in 1986 and then falls to $83.22 by 1989. The feeder calf price rises by 1.6% in 1985 and 5.9% in 1986, falling to $84.40 in 1989. Consequently, the inventory of cattle and calves declines until 1985 and then grows at 0.8%, 1.4% and 0.2%, respectively, in 1986, 1987 and 1988 and declines 0.9% in 1989. Marketings fall until 1987 and then grow by 3.6% and 4.5% in 1988 and 1989. Slaughter is almost flat in 1985, is down 5.3% in 1986, and returns to the 1985 level in 1989. Inspected production follows essentially the same pattern.

Net trade with the U.S. is expected to fall to 109.2 million pounds in 1985, to continue falling to 74.1 million pounds in 1988 and to recover only slightly in 1989. The rising prices in 1985, 1986, 1987 lead to falling per capita disappearance at –0.4%, –4.0%, –0.7%, respectively, after which prices start to fall. In 1988, per capita disappearance rises by 1.6% and in 1989 by 1.5%. Assuming that net imports from the rest of the world is flat at around 135 million pounds, stocks of beef fall over the entire period.

The U.S. countervail tariff for pork is not taken into consideration for the baseline simulation. Instead, it is treated as an alternative scenario in a later section of this paper. Selected results of the baseline simulation for pork are presented in Table 4.5.

TABLE 4.4 BASELINE BEEF VARIABLES AND PERCENTAGE CHANGE FROM YEAR EARLIER

	1984	1985	1986	1987	1988	1989
Inventory, cattle and calves	10 967	10 771	10 861	11 015	11 038	10 936
	-3.5%	-1.8%	0.8%	1.4%	0.2%	-0.9%
Marketings, slaughter cattle	3 822	3 756	3 568	3 514	3 642	3 805
	-1.2%	-1.7%	-5.0%	-1.5%	3.6%	4.5%
Trade, slaughter cattle	238.6	144.3	148.7	93.3	125.3	164.4
Slaughter	3 584	3 611	3 419	3 421	3 517	3 640
	-3.5%	0.8%	-5.3%	0.1%	2.8%	3.5%
Inspected production	1 883	1 891	1 804	1 809	1 844	1 893
	-4.4%	0.4%	-4.6%	0.3%	1.9%	2.6%
Net trade with U.S.	157.4	109.2	82.9	78.8	74.1	81.4
Net trade with others	-178	-136	-138	-126	-137	-133
Ending stocks	46.3	46.68	39.74	33.32	31.86	30.65
	-12.8%	0.8%	-14.9%	-16.2%	-4.4%	-3.8%
Per capita disappearance	84.70	84.33	80.97	80.37	81.63	82.82
	-4.0%	-0.4%	-4.0%	-0.7%	1.6%	1.5%
A1-A2 steer price Toronto	85.25	87.00	90.40	87.24	84.98	83.22
	8.2%	2.1%	3.9%	-3.5%	-2.6%	-2.1%
Feeder calf (500-600 lb) price Toronto	86.9	88.3	93.5	91.1	87.5	84.4
	2.4%	1.6%	5.9%	-2.6%	-4.0%	-3.5%
CPI beef	106.7	111.1	115.7	114.3	114.4	115.0
	6.5%	4.2%	4.1%	-1.2%	0.0%	0.5%

The Index 100 hog price in Toronto averages at $73.21/cwt in 1985, rises to $75.58/cwt in 1986, falls to $69.05/cwt in 1987, and then rises to $74.24/cwt and $76.44/cwt in 1988 and 1989. Pigs on farms fall by 0.6%, 1.0% and 1.5% in 1985, 1986, 1987, respectively, and then rise by 1.4% and 1.2% in 1988 and 1989. Sales rise by 2.1% in 1985, fall to 1988, and then rise by 1.0% in 1989.

Exports of live hogs rise to 1 451 000 head in 1985 and then average about 1 300 000 head between 1986 and 1989. This means that pork production will rise to 1853 million pounds in 1985, fall to 1847, 1830 and 1781 million pounds, respectively, in 1986, 1987 and 1988, and then rise to 1794 million pounds in 1989.

TABLE 4.5 BASELINE PORK VARIABLES AND PERCENTAGE CHANGE FROM YEAR EARLIER

	1984	1985	1986	1987	1988	1989
Inventory	10 852	10 789	10 677	10 512	10 662	10 794
	1.0%	-0.6%	-1.0%	-1.5%	1.4%	1.2%
Sales	14 601	14 900	14 772	14 586	14 274	14 402
	7.5%	2.1%	-0.9%	-1.3%	-2.1%	0.9%
Exports	1 346	1 451	1 335	1 267	1 290	1 333
Slaughter	13 254	13 449	13 437	13 319	12 984	13 070
	1.0%	1.5%	-0.1%	-0.9%	-2.5%	0.7%
Production	1 838	1 853	1 847	1 830	1 781	1 794
	1.0%	0.8%	-0.3%	-0.9%	-2.6%	0.7%
Net trade with U.S.	295.7	312.7	274.9	215.8	163.0	161.1
Net trade with others	58.3	30.8	44.0	44.0	44.0	44.0
Ending stocks	24.75	22.30	20.96	19.87	17.73	16.58
	7.4%	-9.9%	-6.0%	-5.2%	-10.8%	-6.5%
Per capita disappearance	59.0	59.7	59.8	60.9	60.6	60.7
	-2.9%	1.1%	0.3%	1.8%	-0.5%	0.1%
Index 100 hog price, Toronto	72.85	73.21	75.58	69.05	74.24	76.44
	2.6%	0.5%	3.2%	-8.6%	7.5%	3.0%
CPI pork	119.0	123.4	126.4	126.3	131.5	137.3
	1.9%	3.7%	2.4%	-0.1%	4.1%	4.4%

Net trade in pork to the U.S. rises to 312.7 million pounds in 1985 and then falls steadily to 161.1 million pounds in 1989. Per capita disappearance in response to the changes in price rises by 1.1% in 1985, is basically flat in 1986, rises by 1.8% in 1987, falls by 0.5% in 1988, and is basically flat in 1989.

Assuming that net trade with the rest of the world is 30.8 million pounds in 1985 and 44 million pounds in 1986 through 1989, ending stocks of pork will also fall during the forecast period.

Stabilization exercise

Implementation

The purpose of this section is to indicate the model adjustments required to carry out each of the experiments and to detail how the model's decision-making process has been modified. The baseline scenario includes the stabilization program currently in effect for

slaughter cattle and hogs (following the Agricultural Stabilization Act of 1975). Since the slaughter cattle program generates virtually no payments, it is incorporated into the model to meet the requirements of the stabilization experiment rather than those of the baseline scenario. Under the baseline scenario, the current hog stabilization program generates payments in 1979-80, 1980-81, 1983-84 and 1987-88. It has been assumed that these payments affect future sales of hogs by all Canadian producers in the same manner as changes in prices and that producers do not anticipate payments. In the ASA baseline case, payments are calculated on a fiscal year basis, and it is assumed that a payment made in the first quarter of a year influences decisions made by producers over the following 4 quarters.

The stabilization experiment consisted of applying stabilization formulae to the hog, slaughter cattle and cow-calf sectors, similar but not identical to those proposed recently in Canadian federal and provincial negotiations for a new stabilization plan, as described below. It should be noted that, for this exercise, funds for stabilization are funded by the state; it is assumed that producers do not contribute funds to the programs.

The support price of the feeder calf program used in this experiment corresponds to 85% of the average price of feeder steers weighing 500 to 600 pounds in Saskatoon over the last 10 years (during the fourth quarter), adjusted according to the gross national expenditure implicit price deflator. The program is annual, and payments are made when the average calf price falls below the support price. In explicit terms, the formulae for this sector are:

$$\text{Annual support price} = 0.85 \cdot \left(\sum_{i=1}^{10} \frac{P_{t-i}}{10D_{t-i}} \right) \cdot Dt$$

Annual payment = minimum (0, support – price)

where P_t is price and D_t is the deflator.

Payments are disbursed in the fourth quarter of the year. The total payment is based on the number of beef cows in the herd (not the number of calves sold) and a rate of 4.275 hundredweight per calf. These payments are incorporated into the sales equations for western and eastern cows and heifers and therefore have a direct impact on the size of the beef cow herd. It is assumed that producers consider payments as an integral part of the price. Since the program is annual, it is also assumed that payments influence decisions of producers not only during the quarter they are issued

but also during the following 3 quarters. With such a program, producers would be able to anticipate payment only from the last quarter necessary for calculating the support price, that is, when they have a good idea of the average price for the current year. These payments are not incorporated into the calf slaughter equations, since the decision to slaughter or to fatten has no effect on the amount received by the producer.

The slaughter cattle stabilization program used in the experiment is quarterly and covers sales of steers and heifers. The formula adopted is that of the "guaranteed margin" type. The support price for a given quarter corresponds to the cost of livestock feed and of feeder calves plus 95% of the average margin for the same quarter in the previous 5 years. The cost of feed is based on the weighted average for producing a long keep steer in eastern and western Canada. The cost of the feeder animal corresponds simply to the price of feeder steers weighing 500 to 600 pounds in Saskatoon 3 quarters earlier, multiplied by the ratio of the animal's weight at the beginning to that at the end of the fattening period (500 lb divided by 1050 lb). To this is added the cost of transporting calves from western to eastern Canada. The weighted price of A1 and A2 steers in Toronto and Calgary is used to calculate the margin. Every time the weighted price of steers is below the support price, the program generates a payment. The total payment is the product of the payment as defined above, steer and heifer sales, and the number of hundredweight per animal. With the program, we have established the hypothesis that producers are only able to anticipate the payment for the current quarter. We also assume that feedlot operators consider these payments an integral part of the steer price and that they accordingly adjust their demand for feeder calves when there is a payment. Considering this hypothesis and the fact that feeder calf imports are an exogenous variable in the model, slaughter cattle stabilization payments (like steer prices) have a major direct impact on feeder calf prices. The stabilization formulae for the slaughter sector are:

$$\text{Support price} = 0.95 \cdot \sum_{i=1}^{5} \left(P_{t-4i} - C_{t-4i} \right) / 5 + C_t$$

$$\text{Payment} = \text{minimum}\,(0, \text{support} - \text{price})$$

where C_t is cash cost and P_t is price.

The hog program and its hypothesis are similar in all respects to the program for slaughter cattle, except so far as the costs of production are concerned, in which case all cash costs are included. In the model, payments cash costs are included. In the model, payments influence prospective sales of hogs in all regions of Canada, just as price increases would.

Modeling concerns

Prior to discussing results from the simulation exercises, it is important to comment on several characteristics or deficiencies in the model's present specification that limit its application to stabilization analysis. These concerns relate to the way in which the stabilization programs have been implemented and also to the structure of the model as it has been constructed to simulate actual historical experience.

The modeling of stabilization relies critically on the specification of expectational and risk response characteristics of producers. In this regard, the model makes very naive assumptions, although perhaps they are the most realistic, given the nature of the stabilization programs and an inability to anticipate or to test what producers expectations and risk response would be to the new programs. While this does not necessarily invalidate all of the results the model generates, it does mean that results need to be interpreted within a specific frame of reference.

First, in the model, stabilization payments have been incorporated under the assumption that producers expect payments in the next production period to be the same as those in the past production period and employ them accordingly in the calculation of relevant price ratios; hence, the predicted output and trade response to these hypothetical stabilization initiatives must be interpreted as upper extremes to the impacts that could conceivably occur. Most analysts would agree that the type of stabilization payment in question does not have such a direct price effect and that farmers are much less responsive to incremental support level increases than they are for incremental price increases, if they respond at all to support levels. Martin and Urban (1984) find that the elasticity of farmers' responses to higher support price levels is approximately one-half that of the direct price response. While this result is not necessarily representative of the present area of study, it does imply that the assumption of identical parameters on prices and payments is an appropriate subject for research.

A second point worthy of some discussion is the fact that a risk proxy (and other distributional information) has not been explicitly incorporated in the model specification (Just, 1974; Traill, 1978; Harrison, 1982). Specifying a model in this manner is equivalent to assuming either that all market participants are risk neutral or that, although unstable, the series of concern is predictable. In this context, the emphasis is thus placed on market variability rather than on market risk.

Strictly speaking, it is only the stochastic element of market instability which can really be termed "risk." The predictable components (cyclical elements, seasonal elements, etc.) by definition can be identified if an appropriate specification is selected. Hence, predictable instability cannot really be termed "risk." One should not conclude, however, that the deterministic component is not a cause for concern; it does affect storage costs, marketing costs, firms' liquidity positions, debt/equity ratios and so on. A thorough examination of the impacts of stabilization initiatives should include both components. Some risk proxy measures have been examined, but with modest success. However, these proxies do not lend themselves readily to the *ex ante* simulation of stabilization policy and therefore have not been included in this discussion. It is difficult to anticipate whether or not incorporation of these features would change the general results significantly.

Having noted these deficiencies, it is important to recognize where the model does allow conjectures to be made. Critical to the assessment of any policy's (present or proposed) effectiveness is the environment in which it is implemented or, from a modeling perspective, the assumptions that drive the model. It is not appropriate here to detail all of the assumptions that play a role in the model's specification and estimation; however, those assumptions which, for the most part, drive the model in this particular application and, in so doing, provide the intuition for the (more precise) estimation results that follow are addressed. By adopting this approach, it will be apparent that planners must be extremely conscious of the production and trading environment which producers face before they advocate a particular policy in preference to another.

The baseline scenario provides a caricature of the current situation. It is assumed that:

- Canadian prices follow closely the U.S. prices (i.e., Canada is a small country and free trade occurs);
- feed and other input costs are exogenous;

- import restrictions are in place for feeder cattle and calves, and these imports are exogenous to the model, which means that, at least in part, feeder calf prices are determined endogenously with a floor price set largely by the U.S. price of feeder cattle;
- a price stabilization scheme with adjustments for cost levels is in place for the feedlot and hogs subsectors (slaughter cattle market) according to the current ASA provisions; however, in the stabilization exercise, it is assumed instead that a margin stabilization scheme is in place in the feedlot and hogs subsectors and that a price stabilization scheme is in place in the cow-calf sector.

The effectiveness of any stabilization policy depends critically on whether an economy is large or small in the context of the theoretical literature and on the characteristics of the trade regime. If trade in feeder cattle is entirely restricted, then the feeder cattle market becomes a domestic market. This means that feedlot operators, through the competitive bidding process, will find that their returns to some degree are self-stabilizing, because most of the price volatility they face is passed on to the feeder cattle market. When trade restrictions are in place, trickle down effects in the short-run are assured, because of the inelastic short run supplies of feeders. That is, a price stabilization scheme for slaughter cattle will result in more stable feeder cattle prices *ceteris paribus*. Nevertheless, it is still unclear why a stabilizing authority would want to intervene in the slaughter cattle market under a restricted trade regime, since the principle result of such efforts would be to stabilize the prices and possibly the returns of cow-calf operators. It would seem that a scheme specifically designed for the cow-calf sector would be more effective.

In the model, only imports of feeder cattle are exogenous and/or constrained. Exports of feeder cattle take place in response to U.S. variables in addition to the Canadian steer price and grain costs. In this sense, the U.S. market provides a floor price to feeder cattle. Consequently, when exports of feeder cattle are taking place, payments to the slaughter cattle sector cause these exports to be cut back, and prices are bid up according to the supplies of calves available. With imports of feeder calves exogenous to the model, payments to the slaughter cattle sector necessarily trickle down to the cow-calf sector in the short run and may to some extent trickle up in the longer run. However, since in the real world import restrictions due to quarantine requirements may not be an absolute barrier to trade, imports may take place at some profitable price differential between Canadian feeders and those in the U.S. In

short, the model assumes that imports will not increase, and may thus provide overestimates of trickle down, compared with those that actually would occur.

General model results

Given the discussion of the model in the opening section, the assumptions and simulation of the baseline scenario, and the stabilization program and implementation as described above, measurement of the impact of stabilization can be obtained by comparing the baseline simulation with the model simulation incorporating the stabilization program. This subsection traces the impact of the program on producers and consumers as well as on trade.

A comparison of the baseline scenario and the stabilization scenario indicates additional payments to producers over the period 1980-86 period as indicated in Table 4.6. These payments constitute an injection to the livestock economy if they are made by government. The point is that the proposed programs appear to cost more than seven times as much as existing (ASA) programs (note that existing provincial programs are not modeled). The hog program is relatively more expensive. The total payments from the new programs represent about 5.7% of baseline farm cash receipts in the case of the hog sector, 2.3% for the cow-calf sector and 1.5% in the case of the slaughter cattle sector.

TABLE 4.6 QUARTERLY PROGRAM COSTS, 1980 TO 1989[a]

	Proposed program		Status quo	
	Total	Mean	Total	Mean
	($ million)			
Total payment	2 044	51.1	274.4	6.9
Slaughter cattle	456	11.4	14.0	0.4
Calves	540	13.5	0	0
Hogs	1 048	26.2	260.4	6.5

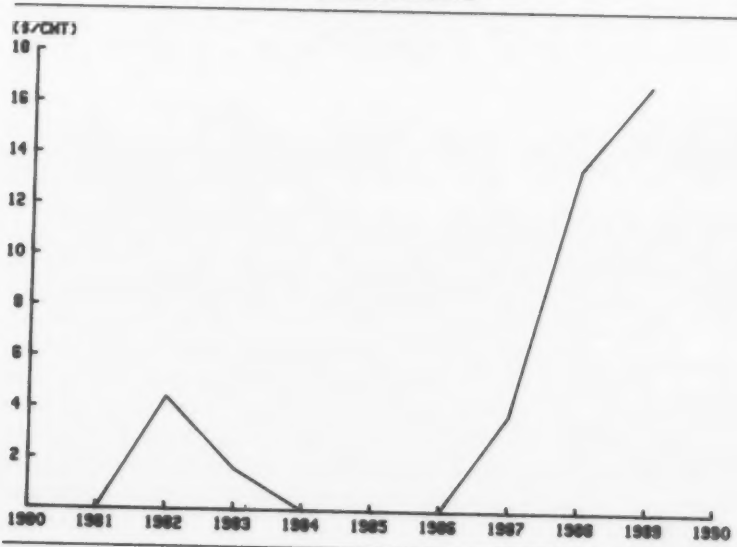
[a] Annual program costs have been divided by 4 to derive quarterly estimates.

With payments of the magnitudes indicated, the programs can be expected to affect the agricultural economy as a whole, albeit very little. For instance the simulation results indicate that the growth

rate in GDP agriculture improves from 2.28% per year to 2.33%. Interestingly, the consumer price index for food remains much the same under the stabilization scenario and in fact increases marginally more than in the baseline. This is primarily due to the price linkages existing between Canada and the United States and to the fact that the new programs encourage herd rebuilding and cause cow prices to augment marginally more than steer and hog prices decline. In aggregate, all livestock cash receipts increase on average about 4% over the period.

The more interesting results of the simulations are those on a micro scale. In particular, the questions of resource allocation (quantity responses), of the incidence of benefits among producers, consumers and the trade sector, and of the interdependence of programs are ones for which the simulation provide interesting insights. Figures 4.3 to 4.8 display the estimated effects on producer returns.

FIGURE 4.3 SIMULATED STABILIZATION PAYMENTS FOR COW-CALF OPERATIONS[a]



[a] Payments as generated by formula in text and forecasts of FARM livestock model

FIGURE 4.4 PRICE OF FEEDER CALVES, CALGARY

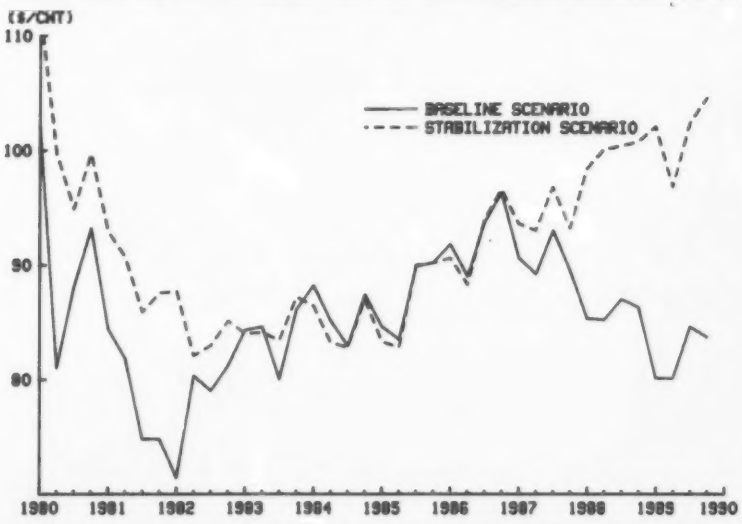
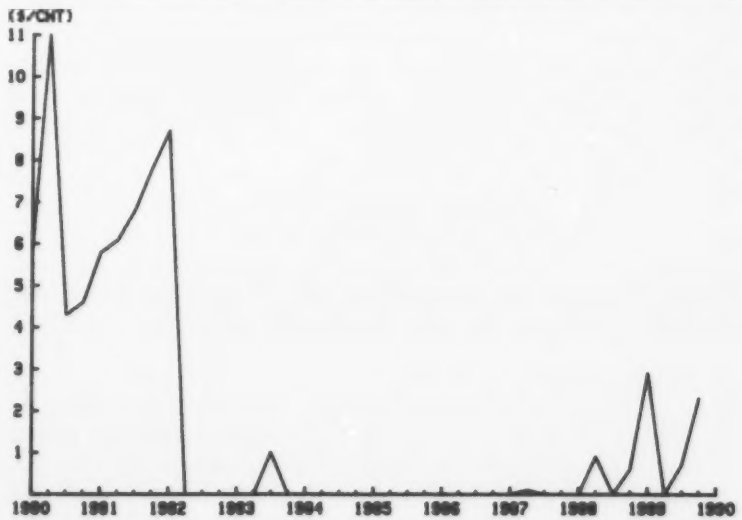


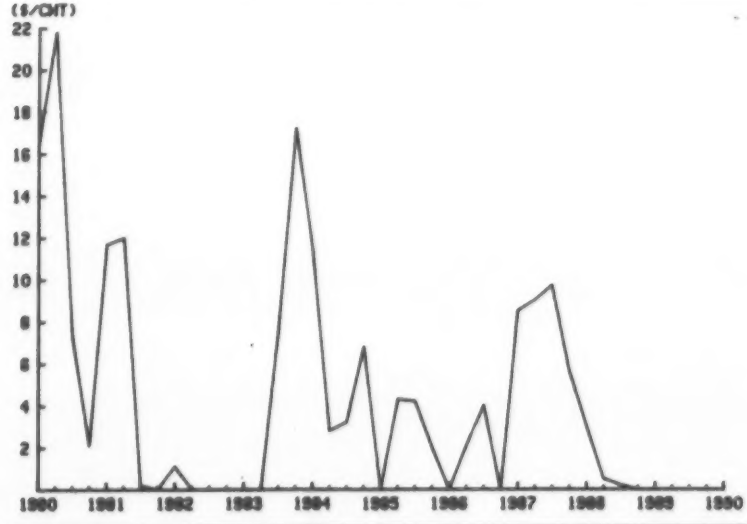
FIGURE 4.5 SIMULATED STABILIZATION PAYMENTS FOR SLAUGHTER CATTLE OPERATIONS[a]



[a] Payments as generated by formula in text and forecasts of FARM livestock model

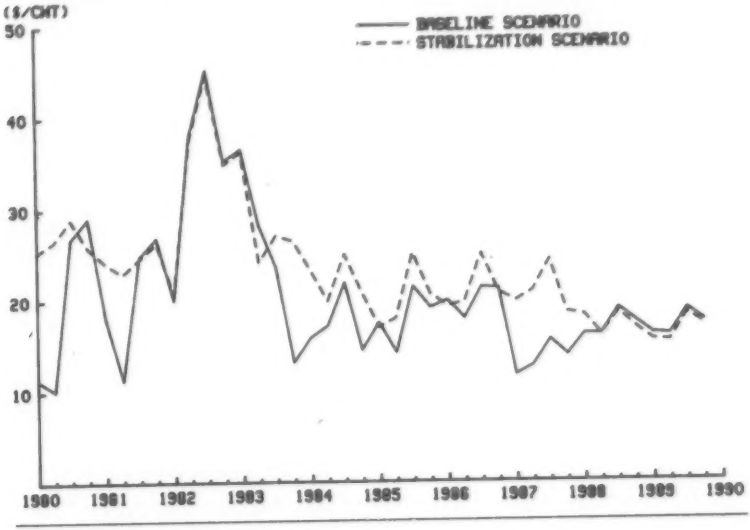
FIGURE 4.6 SLAUGHTER CATTLE: STEER PRICE CASH COST MARGIN

FIGURE 4.7 SIMULATED STABILIZATION PAYMENTS FOR HOG OPERATIONS[a]



[a] Payments as generated by formula in text and forecasts of FARM livestock model

FIGURE 4.8 HOGS: PRICE CASH COST MARGIN



Producer sector results

Table 4.7 summarizes predicted payouts to producers over the period for the slaughter cattle, cow-calf and hog programs. The table illustrates the time pattern of payments on a per unit basis. For the beef sector the simulations show three distinct periods, 1980-82, 1983-87 and 1988-89, with payments made in the first and third periods. The high concentration of payments in the first period would appear to be due to the very high price/margin experience of 1978-79 and the averaging formula of the programs. For hogs, the payments appear cyclical in nature. The manner in which the stabilization payments are implemented into the model is described at the beginning of this section. Payments have simply been added to prices. The assumptions of naive payments expectations and no risk response are simplifications and ignore the literature concerning expectations and risk response, which in themselves are crucial elements of the stabilization debate. However, these assumptions nevertheless provide interesting analysis, which perhaps may teach valuable lessons to those designing stabilization plans.

Table 4.8 outlines the estimated overall effects on producers. The discussion which follows traces these effects in more detail.

TABLE 4.7 SIMULATED PAYMENTS OF PROGRAM BY QUARTER

Year and quarter		Slaughter cattle	Cow-calf[a]	Hogs
		($/cwt)		
1980	1	5.75		16.43
	2	11.00		21.76
	3	4.33		7.37
	4	4.64	0	2.16
1981	1	5.80		11.68
	2	6.18		12.07
	3	6.77		0.27
	4	7.77	0	0
1982	1	8.67		1.15
	2	0		0
	3	0		0
	4	0	4.41	0
1983	1	0		0
	2	0		0
	3	1.10		7.53
	4	0	1.55	17.24
1984	1	0		11.42
	2	0		2.79
	3	0		3.25
	4	0	0	6.79
1985	1	0		0.09
	2	0		4.39
	3	0		4.20
	4	0	0	2.02
1986	1	0		0
	2	0		2.20
	3	0		4.04
	4	0	0	0
1987	1	0		8.52
	2	0.13		9.08
	3	0		9.70
	4	0	3.83	5.64
1988	1	0		3.06
	2	0.92		0.50
	3	0		0.27
	4	0.65	13.50	0
1989	1	2.86		0
	2	0.04		0
	3	0.74		0.06
	4	2.39	16.78	0
Mean		1.74	4.00	4.39
Standard deviation		2.97	6.14	5.58

[a] The mean and standard deviation calculations have been computed on an annual basis.

The large payments indicated in Table 4.7 to slaughter cattle producers bid up feeder calf prices completely, such that stabilization payments trickle down to cow-calf operators. In fact, feeder calf prices increase on average by more than $10/cwt over the first period of payments to slaughter cattle operators. This impact on feeder prices sets a mild rebuilding phase in motion with these typical features: a reduction in heifer and cow slaughter with building inventories of female cattle and a substantial decrease in both slaughter and exports of calves in response to higher returns in the fed market in Canada. The payments to cow-calf operators in 1982 and 1983 serve to further stimulate herd rebuilding.

During the second period of no payments to the cattle industry, prices for fed cattle and feeder calves drop below the baseline estimates because of higher domestic supplies of cattle. The final period during which payments to cattle enterprises resume has characteristics similar to the first period, except that expected payments are much smaller in size.

Table 4.8 summarizes these effects over the entire period. Note for instance that cattle marketings increase only very marginally over the period, due primarily to higher steer marketings and lower cow marketings as a result of herd rebuilding. The simulation results show marginally higher variability in supply. Beef output increases on average by 3 million pounds per quarter. In addition, whereas the average steer price (including payment) increased by about $1.40/cwt over the period as a result of payments, the margin over feed and feeder costs increased by only $0.29/cwt, due to the pass through of payments to the feeder calf sector. Steer prices including payments were no less variable with the program than without it, although the variability of the margin was reduced. Calf producers would be expected to receive $6.29/cwt more on average for their calves; with an average cow-calf payment expected at about $4/cwt, the estimated effect of trickle down from the slaughter cattle sector would be about $2.19/cwt. Gross receipts to slaughter cattle producers increase about $13 million per quarter, and those for cow-calf operators by about $32.4 million per quarter. The simulations show the variability of cash receipts to cattle producers is or would be little affected by stabilization measures.

Table 4.7 illustrates regular, cyclic payments to hog producers. Under the assumptions in implementing the stabilization plans, hog marketings respond accordingly. Payments average $4.39/cwt per quarter, and for the most part significant payments are made during the first half of the period. Throughout the whole period,

TABLE 4.8 PRODUCER IMPACTS OF STABILIZATION PROGRAMS, 1980 Q1 TO 1989 Q4

Variable	Program		Status quo		Difference	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
Producer price[a]			($/cwt)			
Steers	79.51	3.85	78.11	3.84	1.39	2.87
Calves	89.66	6.55	83.37	4.63	6.29	6.97
Hogs	75.67	4.78	72.72	7.05	2.95	4.81
Margin[a]			($/cwt)			
Steers	6.47	2.52	6.18	3.76	0.29	2.76
Hogs	23.19	6.37	20.23	7.89	2.96	4.81
Marketings			(thousand head)			
Cattle	936.2	46.0	931.1	41.6	5.1	11.9
Steer	375.0	34.4	371.2	32.7	3.9	4.8
Cows	221.8	39.9	222.9	37.0	−1.2	8.0
Hogs	3606.0	212.6	3522.0	198.5	83.9	40.2
Cash Receipts[a]			($ million)			
Slaughter cattle	810.5	39.4	797.2	38.1	13.3	18.7
Calves	623.8	269.5	591.3	271.3	32.4	58.5
Hogs	480.3	34.4	452.9	48.4	27.4	30.2

[a] includes payment

prices including payments average $2.95/cwt higher than the status quo and marketings average about 2.3% higher. Pork output is higher by 11.5 million pounds per quarter. Both prices and margins over cash costs appear much less variable with the enhanced stabilization regime. Cash receipts to hog producers average $27.4 million more per quarter under the proposed stabilization scheme. This compares with an average increased payment of about $20 million per quarter; the higher cash receipt gain is due to revenue from additional marketings, offset somewhat by lower market prices (down 0.6% over the period).

Trade sector results

As outlined in the description of the model, the Canadian livestock economy is modeled as a small open economy with trade restrictions on live feeder cattle imports. Consequently, Canada is a price taker for slaughter cattle, beef, hogs and pork. Eastern Canada is on an

import basis for slaughter steers and heifers as well as high-quality beef. The impact of the stabilization programs on producers, as outlined above, is to produce more livestock products. Given the assumptions of the model the effect on trade variables is to increase exports and to decrease imports, causing a widening of the price differential in goods exported between the U.S. and eastern Canada and a narrowing of the price differential in the case of goods imported. An interesting result is that, of the additional production generated by the stabilization programs, about 90% affects the trade balance in both the beef and the pork cases.

Table 4.9 outlines the general effects on trade variables of the stabilization program.

TABLE 4.9 EFFECT OF STABILIZATION ON TRADE, 1980 Q1 TO 1989 Q4

Variable	Stabilization program		Status quo	
	Mean	Standard deviation	Mean	Standard deviation
Live, net trade		(thousand head)		
Cattle	37.1	23.2	33.1	21.4
Steers	-1.0	14.6	-4.89	14.5
Heifers	2.6	4.3	2.4	4.3
Cows	35.6	11.6	35.5	10.5
Feeder cattle[a]	6.1	14.3	6.8	13.0
Hogs[a]	232.3	134.8	229.3	134.1
Meat, net trade U.S.		(million pounds)		
Beef				
High quality	-3.0	5.7	-3.1	5.6
Low quality	30.4	9.1	30.4	8.8
Pork	62.8	19.5	53.0	18.0
Carcass equivalent, net trade		(million pounds)		
Beef	12.5	21.9	9.9	19.0
Pork	111.3	28.6	101.2	26.4

[a] These figures are exports, since there are no imports of these commodities.

Consumer sector results

The current discussions on the effects of different livestock stabilization programs give rise to the question of their impacts on Canadian consumers. Given the close relationship between

livestock prices and prices paid by consumers for meats at the retail counter, it is necessary to analyze the effects of livetock stabilization programs on retail meat prices and on consumers' welfare.

The price relationship between Canadian beef, pork and poultry commodities is of fundamental importance to both producers and consumers of livestock and poultry products in Canada. In the case of beef and pork products, the relatively free trade between Canada and the much larger United States markets results in relatively small domestic price effects because of shifts in Canadian supply and demand.

The fact that random shifts in Canadian supply have little effect on Canadian prices results from the very elastic excess supply and demand for the U.S., compared with the excess supply and demand for Canada.

A theoretical measure of the impact of different stabilization policies on consumers is given by the concept of consumers surplus. Alfred Marshall (1920, p. 124) defines consumer surplus: "the excess of the price which he would be willing to pay rather than go without the thing, over that which he actually does pay, is the economic measure of surplus satisfaction."

This theoretical concept may be applied in the case of mathematical demand models by integrating the area under the demand curve with respect to quantity from zero to the equilibrium quantity, then subtracting the cost of quantity demanded at equilibrium. The difference is consumers' surplus.

The theoretical basis for the analysis of the impact of price instability on consumers has had a long history, beginning with the work of Waugh (1944) and extended by Massell (1969), Oi (1961) and others. The analysis of benefits and costs of commodity price stabilization using buffer stocks is summarized by Turnovsky (1978) and has been the subject of a number of papers since that time. Martin and MacLaren (1976) analyze the effects of a deficiency payment scheme for the livestock sector.

The Canadian national livestock stabilization scheme is based on the concept of limiting the decline in producers' margins over cash costs relative to a historically determined base. The fundamental differences between the Canadian livestock stabilization schemes and the frequently analyzed buffer stock scheme gave rise to the motivation for Martin and MacLaren's study of market stabilization by deficiency payment programs. They specifically analyze the effects of price versus net revenue stabilization for the case of the pork sector. They conclude that, in an economy faced

with every elastic excess supply-demand functions, very little benefit accrues to consumers because of deficiency payment program, since the resulting additional production is either exported or substituted for imports.

Model results for consumer surplus for beef and pork

In the current model, there is one demand equation each for low-quality beef, high-quality beef and pork. The price and income elasticities for these equations are summarized in Table 4.10.

TABLE 4.10 DEMAND ELASTICITIES CALCULATED AT THE MEAN, RED MEATS, 1980 Q1 TO 1989 Q4

Price/demand	High-quality beef	Low-quality beef	Pork
High-quality beef	-0.75	-	0.12
Low-quality beef	0.12	-0.38	0.22
Pork	0.04	0.31	-0.81
Income	0.38	0.42	0.46

The aggregate consumer surplus for the two beef categories and pork are calculated individually from the area under the per capita demand curves, adjusted for equilibrium consumer costs, and then multiplied by the population, with appropriate adjustments for units and definitions. In this calculation, for simplicity, prices of competing meats and all other included endogenous variables are assumed to remain constant over the range of the independant variable (quantity). This may not be entirely realistic; however, it was assumed that the changes in consumer surplus could be reasonably approximated by this method.

In order to see the total impact of the stabilization program on consumer surplus, it is useful to look at the means of the consumer surplus for beef and pork separately and then for the combined consumer surplus for beef and pork. The mean percentage difference between consumer surplus for the stabilization and the baseline scenarios is given in Table 4.11. It is apparent that the consumer surplus for pork is relatively more affected than is low-quality or high-quality beef. Consumer surplus for the 1980-89 period increases on average by 0.37% for high-quality beef and

increases by 0.54% for pork. Consumer surplus decreases by 0.47% for low-quality beef during this period. The total for low-quality beef, high-quality beef and pork was up by only 0.202% on average over the 1980-89 period.

TABLE 4.11 MEAN PERCENTAGE DIFFERENCE BETWEEN THE STABILIZATION AND BASELINE SCENARIOS, 1980 Q1 TO 1989 Q4

	Consumer surplus	Domestic disappearance	Retail price index
High-quality beef	0.37	0.20	-0.27
Low-quality beef	-0.47	-0.22	-0.01
Pork	0.54	0.28	-0.41

It should be noted that, when the increase in consumer surplus for pork was greatest, the decline in consumer surplus for low-quality beef was also greatest. This reflects the relatively larger decline in pork prices and the strong cross-price effect of pork on low-quality beef, resulting in a leftward shift in the demand curve for low-quality beef. The more pronounced effect of pork price on low-quality beef demand could have been anticipated from an inspection of Table 10, which shows the cross-price elasticity of pork on low-quality beef of 0.31. The cross-price elasticity of low-quality beef on pork is 0.22, and the cross-price elasticity of pork on high-quality beef is zero.

The driving force for changes in consumer surplus between these two scenarios is of course the difference in product prices to consumers. This change in product price arises because of the small but finite elasticities of international supply and demand facing Canada's livestock and meat industries, and the changes in domestic supply in response to the stabilization program.

Summary

Table 4.12 presents some general overall incidence indicators of the nominal monetary changes to different sectors that result from stabilization payments. These measures indicate the effect of payments made by government and are not meant to imply welfare gains from stabilization.

The data in Table 4.12 summarize three important lessons learned about stabilization from the simulation exercise. First, producers benefit the most from stabilization. However, the payment given to the slaughter cattle sector is severely diminished by "trickle down" in the sense that payments bid up feeder cattle prices. In this regard, in reference to the subsection on modeling concerns, this result depends heavily on the assumption of exogenous feeder cattle imports. To reiterate, if price differentials between Canada and U.S. become high, it is likely that the actual import restrictions would be overcome. At some price differential, imports of feeder cattle would take place and limit "trickle down." Second, the results indicate relatively large trade effects of stabilization payments, particularly on the export side. Finally, as could be expected, given the structure of the livestock sector and its relationship to the U.S. market, consumers are not likely to benefit much from stabilization payments.

TABLE 4.12 SUMMARY OF SIMULATION RESULTS, BASELINE AND STABILIZATION SCENARIOS, FARMSTAB MODEL

	Change
	($ million)
Cost of program	1 769
Producer cash receipts	
Slaughter cattle[a]	210
Cow-calf	1 299
Hogs	1 098
Inventory change	140
Total	2 747
Trade value	
Exports	947
Imports	-132
Total	1 079
Consumer surplus	110

[a] netting out the increase in feeder calf expenditures

It cannot be overemphasized that these results are particularly dependent on the assumptions made to implement the stabilization plan. They are thus not predictions of the magnitude of benefits of payments. Rather, they may perhaps be interpreted in a relative sense; that is, if producers incorporate payments into their decision-making processes, then the lessons indicated above demonstrate who would benefit in a relative sense.

Alternative scenarios

The section under the heading "Stabilization exercise" compared the simulations of the baseline and stabilization exercises. This section reports results from variants of the basic stabilization scenario for the purpose of better understanding the responses of the model and the nature of the stabilization programs for each commodity. The first alternative, Alternative I, consists of deducting a percentage levy from producer prices that would finance the stabilization program. The second alternative, Alternative II, consists of an exogenous shock to the model with the stabilization program in effect, in the form of an exchange rate revaluation. Alternative III examines the impact of tariffs on exports of livestock products to the United States. Tables 12 and 13 contain aggregate results which provide broad comparisons among the scenarios.

Alternative I (producer-financed stabilization)

The first alternative scenario is implemented in precisely the same way as the stabilization exercise described earlier. However, a levy rate for each commodity is calculated from the stabilization exercise such that total funds collected equal total funds disbursed over the full period (nominal, no interest applied). This scenario therefore provides some notion of the effects of a wholly producer-financed stabilization scheme on the market. In the case of hogs, the levy amounts to 6.1% of the price. For slaughter cattle operations,the levy rate is 2.31% and, for cow-calf operations, the levy rate is 4.5%. These rates are deducted from prices in the same way that payments are added; consequently, levy premiums are treated as similar to price movements.

Table 4.13 illustrates the general effects of levies compared with the baseline and the general stabilization exercise. Compared with government-financed stabilization, the levy rate on slaughter cattle of 2.31% lowers cash receipts (reduced by levies) by 2.8%, final prices (including payment and levy) by 2.1% and marketings by 1%. For cow-calf operations, cash receipts decline by 7.5% with prices down 7%; for hogs, cash receipts decline by 8%, with prices down 5.5% and marketings down 3%. It may be noted that the producer levy scenario returns prices (including payment and levy) and quantities closer to the baseline level; in fact, prices and quantities in this run are lower than in the baseline, since the baseline includes current ASA programs, which are fully financed by government.

TABLE 4.13 COMPARISON OF BASELINE AND STABILIZATION SCENARIOS WITH AND WITHOUT PRODUCER LEVIES

	Average quarterly value		
		Stabilization exercise	
	Baseline exercise	(government-financed)	(producer-financed)
		($ million)	
GDP in agriculture	834.39	838.07	832.55
CPI food (1981 = 100)	116.83	116.76	116.86
		($ million)	
Cash receipts[a]			
Cattle	797.24	810.54	787.50
Calves	591.28	623.76	577.12
Hogs	452.88	80.32	442.07
		($/cwt)	
Prices[a]			
Steers, Toronto	83.81	85.26	83.47
Hogs, Toronto	73.90	76.80	72.58
Feeder calves, Calgary	85.66	91.95	85.72
Cows, Toronto	53.56	53.59	53.65
		($ million)	
Total cost of programs	6.86	51.07	47.73
Cattle	0.35	11.41	9.61
Calves	0	13.45	13.45
Hogs	6.51	26.20	24.67
		(thousand head)	
Marketings			
Slaughter cattle	931.11	936.21	927.37
Hogs	3522	3606	3497
		(thousand head)	
Inventory			
Beef cattle	6011	6089	5978
		(million pounds)	
Net trade[b]			
Beef and cattle	9.87	12.55	7.60
Pork and hogs	101.16	111.34	98.04
		($ billion)	
Consumer surplus	58.21	58.32	58.16

[a] includes stabilization payments and nets out of levy payments where they apply
[b] carcass weight equivalent

Alternative II (exchange rate revaluation)

The second alternative exercise is implemented to examine the effect of an exogenous macro shock on the model and on the stabilization programs. In this case, the U.S.-Canada exchange rate is revalued over the period from the third quarter of 1985 to the first quarter of 1988 in such a way that the exchange rate of about Can $1.37 to U.S. $1 in 1985 is reduced to Can $1.10 and is kept at this level for the remainder of the period (this would constitute a revaluation of about 20%). It should be noted that this exercise provides only partial results. Exchange rate revaluation would affect many of the exogenous variables used in this model, most notably the consumer price index and disposable incomes.

Table 4.14 illustrates that the effects of exchange rate movements on the livestock sector are significant. Average receipts and prices decrease, but marketings increase marginally. Prices decline in every case. However, net trade declines for beef but increases marginally for pork. Of particular note is the fact that stabilization payments increase over 20% with revaluation. It needs to be noted here that data in the table refer to average quarterly estimates over the full period, whereas the exchange rate change applies only to the period after the third quarter of 1985.

Alternative III (export tariff/import duty scenario)

The final experiment enables an analysis of the effects of tariffs on Canadian exports to the United States of red meats and slaughter animals, such as is currently the case for hogs. To establish the tariffs, the average stabilization payment for each program from the first experiment is used. For hogs, the average payment from the first quarter of 1980 to the last quarter of 1989 is $4.39/cwt. For steers and heifers, it is $1.74/cwt, and for calves it is $4/cwt. The calculated tariff for cows is based on the ratio of average cow prices to steer prices during the above-mentioned period, multiplied by the tariff on steers. For pork, high-quality and low-quality beef, the tariffs on these animals are multiplied by the ratio of average wholesale prices to farm prices calculated between the first quarter of 1980 and the last quarter of 1989. Tariffs are imposed over the entire period of study.

TABLE 4.14 COMPARISON OF STABILIZATION SCENARIO WITH EXCHANGE RATE APPRECIATION AND WITH EXPORT TARIFFS

	Average quarterly value		
	Stabilization scenario	Exchange rate appreciation	Export tariffs to U.S.
		($ million)	
GDP in agriculture	838.07	–	835.23
CPI food (1981 = 100)	116.76	–	116.46
		($ million)	
Cash receipts[a]			
Cattle	810.54	787.06	804.56
Calves	623.76	617.73	619.22
Hogs	480.32	473.79	449.00
		($/cwt)	
Prices[a]			
Steers, Toronto	85.26	83.37	84.83
Hogs, Toronto	76.80	75.61	73.52
Feeder calves, Calgary	91.95	91.51	91.27
Cows, Toronto	53.59	51.88	52.71
		($ million)	
Total cost of programs	51.07	61.97	56.59
Cattle	11.41	12.33	11.89
Calves	13.45	17.34	13.86
Hogs	26.20	32.30	30.85
		(thousand head)	
Marketings			
Slaughter cattle	936.21	937.09	938.76
Hogs	3606	3621	3537
		(thousand head)	
Inventory			
Beef Cattle	6089	6080	6088
		(million pounds)	
Net trade[b]			
Beef and slaughter cattle	12.55	8.06	13.33
Pork and hogs	111.34	112.1	95.0
		($ million)	
Consumer surplus	58.32	59.0	58.64

[a] including stabilization payments where they apply
[b] carcass weight equivalent

The tariff rates calculated are as follows:

Commodity exported	Tariff/cwt
Steers and heifers	$1.74
Cows and bulls	$1.11
Hogs	$4.39
Feeder calves and cattle	$4.00
Low-grade beef	$2.21
High-grade beef	$3.03
Pork	$7.00

The general results as shown in Table 4.13 point out some interesting sensitivities of the Canadian livestock markets to export tariffs. First, export tarifs on trade with the U.S. cause all livestock prices to decrease in proportion to the tariffs applied. Consequently, the tariffs directly influence consumers prices and increase consumer surplus in Canada.

Second, the tariffs cause a reduction in hog and pork trade but an increase in beef and cattle net trade. This results from the fact that the decrease in eastern Canadian imports of high-quality beef products from the U.S. and low-quality beef from other countries is bigger than the decline in exports of cows, bulls and low-quality beef from both the East and the West to the U.S. and of exports from western Canada of steers, heifers and high-quality beef to the U.S. The export tariffs causes significantly higher costs to the stabilization program, as might be expected, and this could serve as a lesson to policy makers.

Conclusions

This paper has reported results of the application of a model to the study of a specific set of stabilization programs for the livestock sector. In the course of this study, a number of lessons concerning the ability of models to deal with the issue of stabilization have been learned (and some relearned). In addition, certain general lessons concerning possible aspects of red meat stabilization in Canada have also been identified. In concluding this paper, it is useful to summarize these in some detail. These lessons are categorized here as modeling lessons and stabilization lessons.

Modeling lessons

Martin and MacLaren (1976) identify the need to examine the issue of producer expectations regarding stabilization payments and producer response to changed risk conditions. This study makes no new advances in this regard. Furthermore, it is clear from the results presented in this paper that conclusions regarding stabilization programs rest heavily on assumptions made with respect to these subjects. However, in considering the problems faced in anticipating producer response *ex ante*, it may be appropriate to direct research in two distinct areas. First, tests on historical data may reveal the nature of actual producer response to existing programs and market risk conditions. Second, sensitivity analysis for different assumptions regarding producer response may be most useful in determining the nature of errors expected in predicting the actual response to stabilization programs.

It was found during the course of study that model detail is useful. In particular, a disaggregated supply sector provides an enriched understanding of the functioning of the market. Along these lines, a complete livestock sector specification provides additional insight. A much smaller model, which may be easier to understand conceptually, may not enable such an understanding.

The simulation exercises draw out the importance of spatial price and quantity linkages between markets, particularly between Canada and the United States. Obviously the flow of payment benefits to other sectors relies particularly on the degree of price flexibility with respect to U.S. prices. While the model appears to perform adequately in this area, structural change in marketing destinations during the 1970s and 1980s (more West to U.S. and less West to East) may be worth closer examination. Perhaps most important is the issue of how imports of feeder cattle might be endogenized in the model in order to gain some understanding of what size of price differential might be required to encourage imports.

Stabilization lessons

The results of the stabilization exercise make clear that programs have intercommodity effects. First, the results show that the extent of "trickle down" may be significant and, consequently, the payment structure may not give an adequate representation of net benefits by sector. Full simulation of programs operating together may be necessary for adequate judgment as to program design. Second, the substitution of low-quality beef and pork in consumer

demand may interlink programs for these commodities, although it needs to be borne in mind that these may be small, because of strong trade linkages.

Given the structure of the North American livestock sector, stimulation of production can be expected to influence trade directly.

Consumers in Canada appear to have little to gain from stabilization payments. This is by and large a corollary to the preceding lesson.

The alternative scenarios illustrate that stabilization costs may be quite dependent on macro variable instability, particularly on exchange rates, as well as on U.S. import tariffs or Canadian export tariffs, which would nullify producer benefits from government-financed stabilization. Such measures would benefit Canadian consumers as well as Americans and other foreigners. Producer-financed stabilization may offer an alternative for stabilizing producer returns, but levy/premium rates established may need to take into account which sectors benefit from payments.

Comment

*William H. Meyers**

I think this is a very useful and well-done paper for people who are interested in information in assistance policy decisions. I have a couple of different kinds of comments.

First, I will mention the procedures, and then I will touch on some of the results. On some of them, I may need some clarification, and others are in the nature of comments. I do think that the paper covered most of the important information that decision makers need, particularly the level and distribution of cost and benefits. There is also some sensitivity testing asking, What if things are different from what we assume? One would always wish for more sensitivity testing, but this takes more time.

In terms of model procedures, there are a couple of comments I want to raise. I am not quite as concerned as the authors are about the assumption that producers make, not about the payments but about the support level computed as an assured return. They do not know what the payments are. Similarly, they do not know what the

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price is going to be. But they do know how the support level is computed. They can easily find the computation for themselves. I would therefore expect rational producers to react to this support level. They know they are going to get it, whether through the market or through the payment. So I am not as worried as you are about it. I acknowledge your concern about the risk response, which is a difficult problem for a lot of reasons. I am not sure when researchers will catch up to analysts to provide the appropriate models that incorporate risk.

At first, I did not understand the assumptions about the participation rate in the program. What I learned under the first part of the analysis is that you assume that everyone is in the program and that there is a levy charged for the program. However, if there is a levy, it might be a voluntary participation program. In this case, the whole think would become more difficult to analyze, because you would also have to determine the participation rate.

As for the procedure – and this applies to most of the policy analysis in which I am involved, too – it would be very interesting to do a stochastic simulation instead of a deterministic simulation. This would be particularly useful when you are looking at stabilization program. It might also overcome some of the problems, especially in a livestock model, in that the point at which you start may make a lot of difference to the results obtained.

Now as for the results, Table 4.8, which reports the changes in the price levels and standard errors, would be useful, I think, if it showed the change in the standard deviation, some of which was explained in this paper. Some variables become more stable under the program and some become less stable. The numbers in the column under "Difference: Standard deviation" in Table 4.8 show the standard deviation of the difference in means rather than the differences in the standard deviations. I think the latter would be more useful.

As for trade effects, it would be best to have endogenized the policy response for the U.S. trade restrictions. The lack of information to do so was covered in your sensitivy test, which was a very useful and feasible way of doing it.

In the summary table, Table 4.12, the benefits seem to exceed the costs of the program. According to my calculation, the benefit-to-cost ratio was about 1.6 under the government-financed program. However, these gains seem to disappear when you share the cost among all the producers. In Table 4.13, there are no net gains, and I am not quite sure why this happened. It would appear

from Table 4.12 that producers could pay for the program and still end up as net beneficiaries. But in Table 4.13, cash receipts net of the producer-financed program costs are below the baseline. This is confusing and needs some explanation.

Overall, the careful presentation of assumptions and results and the judicious use of sensitivity analysis make this a very informative paper. It provides the kind of trade-off information needed by policy makers and the kind of behavioral information needed by the economists to evaluate the study.

Comment

*Suren Kulshreshtha**

The paper by Charlebois and Cluff sets out to perform a rather ambitious task. It proposes to assess the economic effect of stabilization policy on four groups: the livestock sector, the consumers, the foreign sector, and the government sector.

I would like to divide my comments on the assessment of the benefits of stabilization policy using the FARMSTAB model in three parts.

- What are the conceptual and measurement issues that need to be addressed in an attempt to design a stabilization policy?
- What characteristics do we deem necessary of our empirical tools in order to use them in the above exercise?
- What major empirical issues remain unresolved or worthy of further improvements, particularly in the context of Agriculture Canada's FARMSTAB model?

Conceptual and measurement issues

Development of an appropriate stabilization scheme presupposes answers to many questions. However, some of these issues are complex and may even be considered far beyond the theoretical and technical capabilities we now possess to analyze them. Nonetheless, researchers should be alerted to these issues.

Generally speaking, stabilizing schemes are used in an effort to stabilize producers' prices with the objective of evening out farm

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incomes over a period of time and to provide stability in a given subsector, in order to assure continuity of production. Although producers' income stabilization is the ultimate goal of these policies, two features are noteworthy. First, off-farm incomes have been contributing an increasing proportion of the total farm household incomes in more recent periods, although they are not generally taken into account in formulating agricultural income goals. Second, stabilization is biased toward periods of declining prices, since it comes into effect only at this time.

The major argument in support of the latter feature in the choice of stabilization measure is the concern of the policy makers over the possible collapse of the country's production and export potential during a period of depressed farm income caused by depressed farm prices. However, this feature of price stabilization has an implication for the consumers. By making prices higher than the market-clearing level, the producers gain and consumers lose. These results are confirmed by Waugh (1944), Oi (1961), and Massell (1969). A similar protection is not available to the consumers during a period of rising prices. In an extreme case, exorbitantly high prices paid by consumers may have a lasting impact upon the level of consumption for that commodity and so have implications for future aggregate producers' incomes.

The next pertinent question in designing a stabilization policy, having selected the price (or income) stabilization as the tool, is the level of price or a range of prices at which market prices are to be stabilized. One must address this question in light of perceived role of prices and their effect upon the sector's efficiency. The prime purpose of a stabilization scheme should be to remove the unnecessary noise in the price signal. But prices should still reflect structural changes in the economy (Anderson et al., 1977) If this were to prevail, farmers can base their resource allocation and production decisions on longer-term market price perspectives.

As for the distributive effects of stabilization policies, stabilization does not help those producers who are usually identified as the target groups. The majority of the benefits of stabilization go to the larger producers. These producers are induced to expand the industry and to produce more than they would otherwise have done in response to market signals only. Without production controls, particularly in the case of nonland-based products, this higher price may have a built-in tendency to encourage large-scale efficient production.

The distributive effects of stabilization schemes upon consumers depend upon expenditure patterns for the commodity whose price is

being stabilized. Generally speaking, as low-income households spend a higher proportion of total income on food than high-income households, an increase in domestic market prices through stabilization has a regressive effect, with the poorer people being hit the hardest.

In summary, the deterioration of the income distribution among nonfarmers and the unwanted distributive effect among farmers amount to a more unequal personal income distribution in the economy as a whole.

Shape of the demand and supply functions

Research by Turnovsky (1974, 1976) and by Just et al. (1972) has demonstrated that the desirability of price stabilization is determined by the shapes of supply and demand curves. Turnovsky (1978) concludes for a closed economy that "the desirability of price stabilization for either producers or consumers does not depend upon the source of the price instability but upon the shapes of the deterministic components of the demand and supply." With open economies, Just et al. (1977) demonstrate that shapes of supply and demand curves are critical in determining qualitative effects of stabilization.

On the behavior of firms, although I did not have access to precise data on distribution of firms, evidence from the U.S. suggests that supply response in the red meat industry is principally determined by a group of highly competitive, respectably sized businesses, which is similar to the observation by Hildreth (1977, p. 898). What do we know about the process of decision making of these firms? Our knowledge is generally obtained from one of three sources: direct observation of these firms by individuals who work with them, the theoretical models of behavior, and empirical studies. Interdependencies among these sources are obvious. Things are complicated further by the presence of risks and by producers' use of the multiple objective function. To complicate the situation further, one must ask whether the producers' response to prices would be altered under commodity stabilization schemes.

Typically, benefits (or losses) from a scheme of price stabilization are measured through changes in producer and consumer surplus. Although these appear to be the best concepts available to us, we should not lose sight of some of the pertinent questions related to them. For example, producer surplus requires the assumption of perfectly elastic input supplies. This, of course, is not met by agriculture. How should producer or consumer surplus be

aggregated over time to measure the long-run effect of policies? These questions require answers before one can meaningfully use these concepts.

Issues in commodity-stabilizing modeling

Despite the variety of stabilization instruments, an assessment of their relative desirability requires a quantitative tool. Generally speaking, an econometric model is chosen for these purposes. Invariably, this requires the following features:

- a realistic, yet manageable representation of the operation of the commodity market to allow for an evaluation of whether policy impacts operate in the proper manner and whether they produce effects that are consistent with *a priori* knowledge;
- a detailed treatment of markets for a realistic introduction of stabilization policy measures, in order to deal with specific marekts and with specific stages of production, processing and final use (if one is al use (if one is dealing with an open economy, the export use has to be identified separately);
- an explanation of differences in economic and technological environments in various regions for the production of a given commodity;
- a time period sufficient to reveal major fluctuations in prices in various markets (annual data smooth out some of the important fluctuations in major markets);
- a model that is dynamic in nature and that recognizes the important biological, decision-making lags in the production and marketing of the commodity;
- unbiased estimation procedures;
- testing and validation of the model performance through sample period simulation, post sample period forecasts and multiplier calculations.

Although many of these steps are standard in any type of model building, several topics deserve special attention in the context of commodity stabilization.

In many empirical studies, it has become customary to assume that demand and supply functions are linear in variables. This assumption is desirable because of the ease of estimation and because it facilitates model simulation. However, the assumption of linearity has serious implications for the benefits of stabilization. For example, Just et al. (1977) show that a switch in specification from linearity to log-linearity, within the range of elasticities estimates forthcoming from various econometric studies, may be sufficient to reverse the gainers and losers. Implications of such

theoretical evidence are serious for empirical studies of stabilization policies.

Theoretical analyses by Oi, Waugh, and Massell are based on the assumption that demand and supply depend upon actual prices. Since consumers typically do not make their decisions until they are confronted with actual prices, this assumption is perfectly natural. For producers, however, such an assumption is unrealistic. Based on works by Koyck (1954), Nerlove (1958), and Muth (1961), various formulations of expectations have been developed. Turnovsky (1974), under limiting assumptions, shows that the gainers and losers from price stabilization depend upon how expectations are made by producers. He contrasts the results using an adaptive expectation scheme and rational expectation hypothesis.

Empirically, however, there are a variety of ways in which expectations can be built into our models. For example, Lin (1977) reports a wheat supply function estimated by using a polynomial lag response pattern. The question is, Do we know enough about the farmers' reaction function with respect to price changes and how to handle it in a market model structure?

It has been demonstrated that the degree of risk plays a role in determining the producers' supply response. The main question is, How should this magnitude of risk be measured in the context of red meat production? Furthermore, the introduction of a stabilization scheme may have a direct effect on the level of supply, or it may alter the behavior of producers from what it might have been in its absence. How a supply function should be specified remains a question for which answers are not plentiful.

Most of the aggregate supply response studies, particularly those that incorporate risk effects, have followed a positive approach. Here the supply function is estimated directly using historical time series. However, I believe that a positive approach cannot effectively account for the effects of changes in the decision-making environment.

Methodology issues

Major issues related to the methodology adopted in the paper are discussed in this section. At the very outset, I would like to make the comment that it is delightful to see applications of Agriculture Canada's FARM model. However, this also raises a concern. The FARM is a forecasting model and perhaps was developed with this objective in mind. A nondiscriminating borrowing of this model as FARMSTAB may lead to a less than satisfactory model for

structural analysis. Since the equations comprising the FARMSTAB were not reported, I am at somewhat of a disadvantage to judge whether this was the case.

Continuing with general comments first, I would like to point out that one of the objectives of this paper was to predict the impact of the stabilization program upon the government sector. Those familiar with the nature of econometric modeling would realize that such a model is rather inadequate in dealing with such a question. One needs a more explicit fiscal impact analysis type of a model to adequately address this issue. In addition to the general comments, the following concerns with the study methodology are noted.

Regarding the functional form, the model includes linear demand and supply functions. As noted above, assumption of linearity may have some serious implications for the magnitude of gains and losses. The literature suggests that, in the context of stabilization policy, an adequate investigation of functional form is warranted. Investigation on lines suggested by Box and Cox (1964) may help this process.

Another issue related to specification of the model pertains to how the random disturbances enter into the problem. Generally speaking, an assumption of additive disturbances in supply and demand is made. Turnovsky (1976, p. 134) has shown that distribution of welfare gains (losses) is very sensitive to the form of disturbance term assumed. He argues that multiplicative disturbances are more plausible in demand than additive ones.

There are two issues related to supply response under risk that have been touched upon earlier. To reiterate, how does the inherent riskiness of production of a commodity affect the production decisions by producers? If a scheme to stabilize prices or incomes is implemented, would it alter the nature of supply response process for the commodity? Both of these questions are complex, and very little theoretical or empirical evidence is available in the context of the red meat industry.

Since supply decisions are made when actual prices are not available and since some of the red meats have a poly-periodic production system, production decisions are based upon expected prices. How do producers obtain information to formulate price expectations? Is the adaptive expectation model or rational expectation hypothesis adequate in explaining supply response for the red meat sector? To what extent is the polynomial lag supply function an improvement that using a geometric lag (which results

from the adaptive expectation model)? These are some of the questions worthy of further probing.

Uncertainties are present in various forms in any modeling exercise. Prediction of the exogenous variables represents a problem for any forecasting and simulation exercise. In the FARMSTAB, simulations for the 1980-89 period are based on single point forecasts for exogenous variables. How accurate are these forecasts? Does their accuracy (or a lack of it) affect the economics of a stabilization scheme? My personal (though limited) experience in evaluating the long-run forecasts of the Chase Econometric model suggests that these forecasts can change considerably, depending upon the point at which the forecasts are made. Since many of the variables that cause uncertainties are random, simulation exercises under alternative assumptions of the stochastic behavior of the exogenous variables can provide a better measure of the variations likely to be encountered.

Moreover, any model – and the FARMSTAB is no exception – is likely to describe the behavior of the commodity market only imperfectly. To the extent that the residual errors in estimated equations contribute to empirical uncertainties, stochastic simulations may offer opportunities for establishing the resulting range of variation of the endogenous variables. However, if the model is misspecified, stochastic simulation may not be of much assistance.

The methodology adopted in the paper compares the results of the baseline scenario with those of stabilization. The differences are attributed to gains (losses) from the stabilization. However, this may not be totally accurate since the baseline scenario also includes a stabilization scheme. Another minor disappointment is that the model is not used in designing a stabilizing scheme by comparing and developing alternate levels or manners in which prices or incomes could be stabilized.

In summary, the paper makes a worthwhile contribution toward the growing literature on commodity stabilization schemes. The comments contained in this paper hopefully would help future researchers in improving these results.

Comment

*Ellen Goddard**

The critical assumptions underlying the analysis presented in the paper are the following.

- Stabilization payments have been incorporated as though producers perfectly anticipate them and employ them in the current quarter in the calculation of relevant price ratios.
- All market participants are risk neutral or alternately, although unstable, the series of concern is predictable.
- Expectational response characteristics of producers are naive.

As pointed out in the paper, the literature on stabilization policy analysis suggests that assumptions in these critical areas directly determine the magnitude and distribution of benefits and costs of stabilization. Also of note in the literature is the importance of functional form and type of assumed disturbances (additive versus multiplicative) in the specification of the stochastic equations employed in a model to analyze stabilization policies (Turnovsky, 1978; Newbery and Stiglitz, 1981).

Attempting to test or relax any of these assumptions is a mammoth job. However, the problems associated with these assumptions suggest that it is not sufficient to present only one set of results in any analysis of stabilization policy. Instead, a range of results should be presented, which could provide the reader with some idea of how sensitive the basic results are to model specification. For example, instead of assuming that producer response to stabilization payment is the same as that to price, a smaller response to stabilization payment could be assumed and the model could be resimulated to establish whether any possibility of directional errors in benefits and costs exist. Empirically, it is somewhat difficult to capture producer response to risk in the marketplace (the literature is largely based on mean variance specification, which assumes that producers' expected utility functions are quadratic or that the risky variable is normally distributed; see Brennan, 1982). However, assuming some response to the reduced riskiness which would occur with a properly organized stabilization program is not beyond the scope of an econometric model. Resimulating a model with an assumed

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response to reduced riskiness would again provide some information about possible deviations from the base results in terms of directional or distributional benefits and costs of stabilization.

The realities of the policy-making process suggest that policy makers would like to discover the response to any policy they choose to implement. Given the inexact nature of economics, a single answer is often difficult to formulate. Sensitivity analysis of the sort I have suggested above could provide the researcher with a better understanding about how sensitive the results are to the necessary assumptions and with a better feel for the answer to give a policy maker.

The analysis in the paper provides a partial equilibrium analysis of stabilization policies in the red meat sector. However, the possibility of resource reallocation in the agricultural sector as a whole, if producers perceive that one enterprise is more stable or less risky than another, should be pointed out. These wider sectoral effects may modify the societal impact of stabilization programs.

It might be worth pointing out in your paper that you have incorporated a very well organized stabilization program into the red meat sector. Producers can predict when payments will be made, and there is little uncertainty associated with whether or not the payments will be made. Any deviation from this well-organized program will have an impact on the level and distribution of benefits and costs of the program.

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5

Beef Sector Modeling and Research Issues

*Richard Stillman**

The purpose of this paper is to discuss the beef sector modeling efforts under way at the Economic Research Service (ERS), United States Department of Agriculture, and to discuss some of the areas within the U.S. beef sector that may impact on the analysis of the Canadian beef stabilization program. In general, the structure of the beef subsector of the quarterly model of U.S. agriculture will be presented along with some of the areas that are being examined within the framework of the model.

As a general overview, ERS is the analytical and economic research staff of the U.S. Department of Agriculture. The scope of the analysis, research and forecasting encompasses commodity production, use and pricing of products such as livestock, field crops, and fruits and vegetables in both the domestic and international area, natural resources and rural economics analysis. As a tool to aid economists in making decisions, ERS has committed resources in the development of mathematical models (Clayton, 1985). Four of the models at ERS are the Food and Agricultural Policy Simulator (FAPSIM), the World Grains, Oilseeds and Livestock (GOL) model, the U.S. agricultural sector mathematical programing (USMP) model, and the Quarterly Model for U.S. agriculture.

FAPSIM is a annual cross-commodity model developed for intermediate-term analysis of alternative legislative proposals and policy options. The GOL model is designed to provide information on mid- to long-term world food supply and demand outlook. A mathematical programming model, USMP, is in place to analyze

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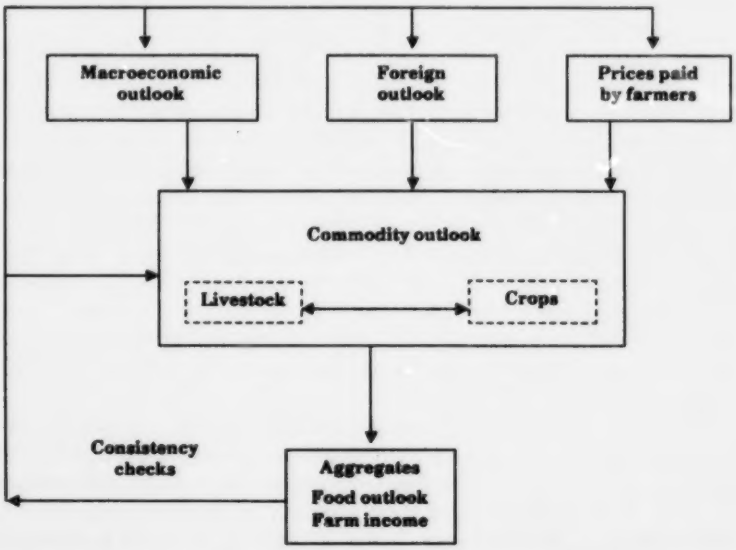
spatial and market equilibrium questions related to general economic and policy analysis. Finally, there is the Quarterly Model for forecasting U.S. agriculture (Westcott and Hull, 1985). This last model will be the focus of discussion in this paper.

Quarterly Model for U.S. agriculture

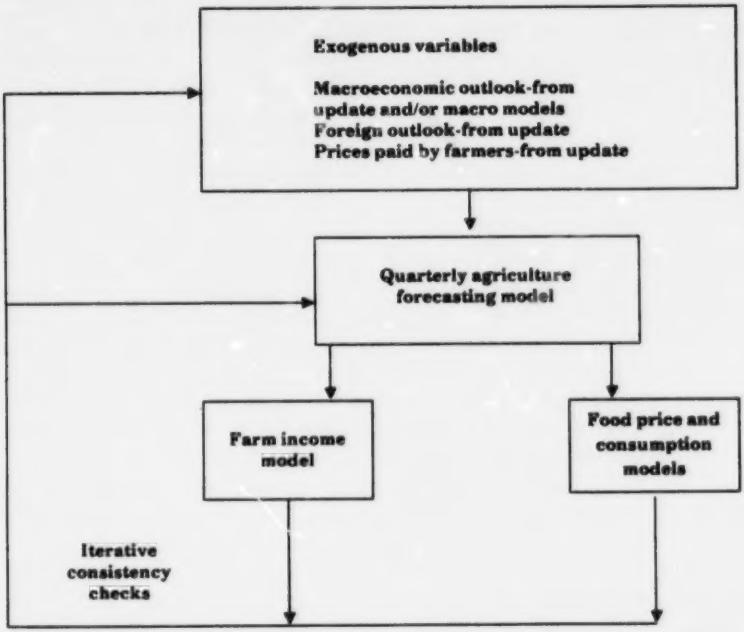
This forecasting model is designed as a short- to medium-range forecasting and policy tool and is used by commodity analysts in the ERS monthly forecasting process and in policy analyses (Figure 5.1). The model covers cattle, hogs, poultry, corn, wheat and soybeans, thereby providing commodity analysts with a cross-commodity picture (Figure 5.2). Analysis of alternative scenarios relative to a base solution can be conducted rapidly with the Quarterly Model by changing selected exogenous factors such as income, exports or weather. This section outlines the model's structure and provides some of the results that have been obtained.

FIGURE 5.1 THE MONTHLY FORECASTING PROCESS AT USDA



Source: Paul C. Westcott and David B. Hull, "A Quarterly Forecasting Model for U.S. Agriculture," Technical Bulletin 1700 (Washington, D.C.: USDA, ERS, May 1985).

FIGURE 5.2 THE ROLE OF THE QUARTERLY AGRICULTURE FORECASTING MODEL

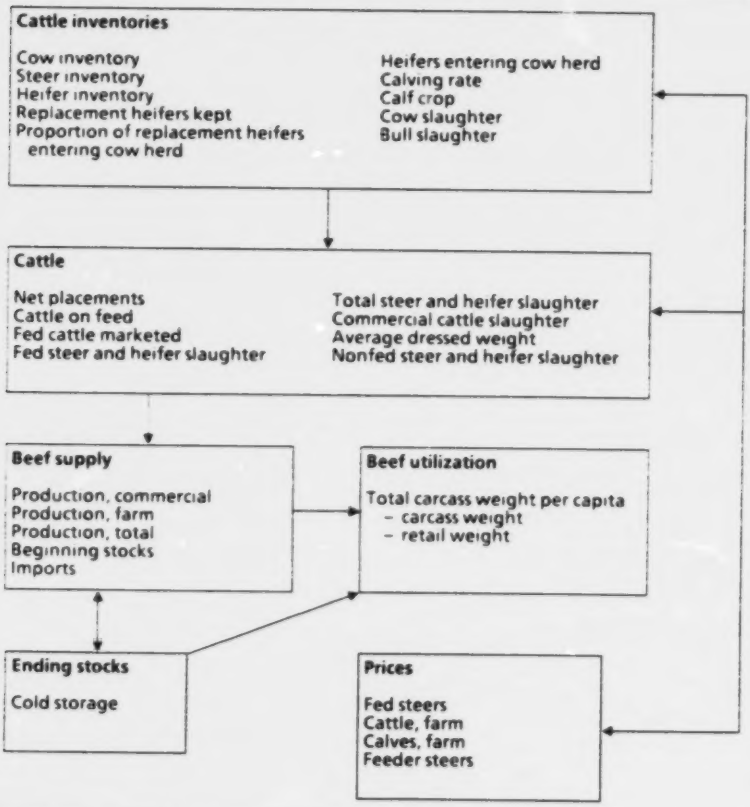


Source: Paul C. Westcott and David B. Hull, "A Quarterly Forecasting Model for U.S. Agriculture," Technical Bulletin 1700 (Washington, D.C.: USDA, ERS, May 1985).

In analyzing the cattle subsector, an important factor is the length of time involved in the actual production process, and cattle production is measured in years. Any reaction by producers involves a long time lag before the realization of decisions occur. The cattle sector is composed of two separate production processes; cow-calf operators and cattle feeders are usually separate entities. Consequently, the cattle sector in the Quarterly Model includes annual equations for the breeding herd to represent the capital stock from which beef production is drawn (Figure 5.3).

Cow-calf operators produce two separate products. First, they provide calves, which may be sold for further feeding in feeding operations or for immediate slaughter. Second, they provide culled cows for the slaughter industry as a by-product of the calf-producing operation. Cow meat is usually used in processed meats and is not valued as highly as fed beef.

FIGURE 5.3 CATTLE SECTOR STRUCTURE



Source: Paul C. Westcott and David B. Hull, "A Quarterly Forecasting Model for U.S. Agriculture," Technical Bulletin 1700 (Washington, D.C.: USDA, ERS, May 1985).

Cattle feeding is the major U.S. meat-producing industry. The output of this industry is a high-quality, high-value live animal used to produce fresh, table-ready cuts of quality meat and, except for by-products, is seldom processed further. Producers use feeds and calves as the basic raw materials from which to attain the finished product. Cattle feeders are therefore the major users of the cow-calf operator's primary product. Decisions made by feedlot operators affect the cow-calf subsector and hence the behavior of the industry through prices paid for calves.

Equations

The annual cattle submodel has 8 equations: 5 of these are behavioral and 3 are identities. All of these equations represent stocks of animal measured on January 1, with the exception of the calf crop equations. Each of the behavioral equations is a function of expected revenues, expected costs and the stock of animals from which this category is drawn. Revenues are represented by feeder steer prices and are divided by the GNP deflator to represent costs, under the assumption that other costs will change in proportion to this inflation measure.

The January 1 cow inventory equation is an identity; current inventory equals last year's inventory adjusted for death loss, minus last year's cow slaughter, plus heifers entering the breeding herd during the last year. The latter two categories represent producers' decisions to expand or contract the herd. Both the number of heifers entering the herd and the cow slaughter are also estimated within the model. The inventory defines the production capacity of the industry representing a capital production stock.

Both steers and heifers weighing more than 500 pounds are used as accounting checks in the cattle inventory. Heifers kept for cow replacement represent an intentions number, which is dependent on the level of the cow inventory and the proportion of cow slaughter to cow inventory. From the focus of the industry, it is the number of heifers that actually enter the herd that is important in determining the production levels of beef for the next few years. The real price of hay is used to represent the pasture conditions. Real hay prices could also represent the nutritional content of the pasture, which could in turn affect the ability of the heifers to calve. To obtain the actual number of heifers that enter the cow herd, the proportion entering the cow herd is multiplied by the number of heifers kept for cow replacement.

The calf crop represents the stock of animals available for the near-term slaughter. A calving rate – the calf crop divided by the cow inventory – is estimated as a behavioral equation. It is a function of the number of heifers kept for cow replacements divided by the cow inventory, the change in real feeder steer prices and a real hay price. The proportion of heifers kept for cow replacements to the cow inventory impacts on the calving rate, because the higher the number of heifers that calve, the larger the calving rate. The calves born to the heifers are counted in the numerator of the ratio, but the heifers are not in the denominator. As the proportion of heifers kept for replacement increases, so does the calving rate, even though the heifers may have a lower biological calving rate.

The feeder steer prices represent returns, and the real hay price represents pasture conditions.

The quarterly cattle submodel contains 22 equations, of which 12 are behavioral and 10 are identities. Behavioral equations reflect both the physical production relationships and economic decision criteria. The important decision points in the quarterly cattle section are the cow slaughter equation and the cattle placement equation. Cow slaughter defines the future production capacity of the cattle sector. Increases or declines in cow slaughter are akin to expansion or reduction in plant capacity in the manufacturing industry. Net cattle placements into feedlots draw from the stock of available raw materials – the calf crop – and represent the producers' expectations of profitability.

Cow slaughter is a function of feeder steer prices, cow inventory and seasonal factors. This equation represents the second factor in the producers' decisions to expand or contract production capacity. Net cattle placements are a function of costs (feeder steer prices and corn prices), returns (fed steer prices), and the calf crop in the previous year as a representation of the stock of animals the placements are drawn from.

Cattle on feed is an identity, which is used to estimate fed cattle marketings. Fed cattle marketings are then used to estimate fed steer and heifer slaughter, taking into account seasonal variability. Nonfed slaughter is estimated and added to fed slaughter to give total steer and heifer slaughter. Commercial cattle slaughter is the sum of steer and heifer, cow, and bull slaughter. Average dressed weight of cattle is then estimated as a function of steer prices and of the ratio of fed cattle to cow slaughter. Cold storage of beef at the end of the quarter is simply a function of beginning stocks and beef exports. Consumption of beef is a net disappearance number and is a residual after production stocks, imports, exports and shipments, and military consumption are accounted for. Beef consumption is presented as a per capita number for both retail and carcass weight.

Steer prices and farm cattle prices are estimated as functions of slaughter levels and of the moving average of disposable income. Feeder steer prices are a function of calf crop, steer prices and corn prices.

Cattle sector validation statistics

The model was evaluated in four quarterly intervals over a "Within sample" period 1971-81, and a "Beyond sample" period 1982-83 (Table 5.1). Three measures of performance were chosen: relative mean absolute errors, the Theil inequality coefficient to measure

TABLE 5.1 QUARTERLY AGRICULTURE FORECASTING MODEL VALIDATION STATISTICS

Dependent variable	Mean absolute error		Theil U coefficient		Relative turning point errors	
	Within sample	Beyond sample	Within sample	Beyond sample	Within sample	Beyond sample
	(percent)				(percent)	
Cattle variables, annual						
Cow inventory	2.0	3.6	0.62	2.17	0	100
Steers on farms	3.6	2.9	1.55	1.02	14	50
Heifers on farms	3.5	8.6	1.21	4.10	43	50
Heifers kept for cow replacements	1.5	4.3	0.21	0.96	0	0
Proportion of heifers kept that enter the cow herd	2.5	14.1	0.28	0.88	0	50
Heifers entering the cow herd	3.5	10.6	0.31	0.97	0	50
Annual calving rate	0.7	2.5	0.21	1.32	0	50
Annual calf crop	0.7	2.5	0.21	3.60	0	100
Cattle variables, quarterly						
Cow slaughter	12.7	14.3	0.63	1.98	11	75
Bull slaughter	10.1	11.7	0.65	2.16	18	63
Net placements	6.0	10.7	0.63	1.27	29	25
Cattle on feed	3.8	8.2	0.34	1.79	29	13
Fed cattle marketed	3.7	4.4	0.46	1.32	14	0
Fed steer and heifer slaughter	3.9	4.7	0.46	1.15	14	0
Nonfed steer and heifer slaughter	19.8	23.2	0.52	0.82	7	38
Total steer and heifer slaughter	2.7	2.3	0.55	1.46	21	25
Commercial cattle slaughter	4.1	2.2	0.57	1.02	11	38
Average dressed weight	1.8	1.7	0.54	1.21	39	25
Beef production, commercial	3.3	1.6	0.62	0.60	14	13
Beef production, total	3.3	1.5	0.62	0.59	14	13
Beginning beef stocks	7.7	9.3	0.44	0.39	14	0
Total beef supply	2.9	1.2	0.63	0.42	7	3
Ending beef stocks	12.0	11.1	0.60	0.44	21	0
Civilian beef consumption, carcass weight	2.9	1.2	0.62	0.50	14	0
Civilian per capita beef consumption, carcass weight	2.9	1.2	0.60	0.65	21	25
Civilian per capita beef consumption, retail weight	2.9	1.1	0.60	0.64	21	25
Fed steer price	7.3	4.4	0.52	1.29	18	50
Cattle price, farm	7.7	11.8	0.44	3.78	25	75
Calf price, farm	11.7	25.2	0.46	3.10	7	63
Feeder steer price	9.2	18.7	0.46	3.01	14	50

the ability of the model to predict changes, and the relative turning point errors. These three measures give an idea of how the model performs from the standpoint of point accuracy, relative to a naive model that predicts no change from period to period. The "Within sample" evaluation statistics appear reasonable. Only 5 of the equations have relative mean absolute errors larger than 10%. In 2 equations, the Theil inequality coefficients were greater than 1; these equations were for steers weighing more than 500 pounds and for heifers weighing more than 500 pounds, which are used only for cattle inventory accounting. For the test period outside the estimation period of the model, the evaluation statistics were not as good. These statistics point out some problems with information that both modelers and beef industry analysts must explore.

The largest model validation errors tended to occur in two areas, the cow inventory-slaughter equations and the cattle pricing equations. In the first area, the cow inventory-slaughter equations may present as much of a qualitative problem as a quantitative problem. Information seems to indicate that the downturn in cow numbers in 1982 may have been caused by cash-flow problems on mixed enterprise farms. Capturing this within the model's framework is difficult, because the information on the cash-flow status of the beef industry may not be applicable to the modeling framework. The willingness of the banking industry to finance farm enterprises is declining, because of the erosion of the equity base within the farm sector. Obtaining a timely measure of the debt status of the farm community as well as forecasting this information is beyond the scope of this short-term model.

The cow inventory and slaughter complex faced several new factors from 1980 to 1985 that the model was unable to pick up; these factors affected decisions of producers in such a way as to cause a decreasing cow inventory trend. Focusing on the important inventory-related equations – cow slaughter equations and the proportion of heifers kept that enter the cow herd – the behavior of producers did not coincide with the projections of the model. Speculation on the cause of the downturn in the cow inventory centers on the cash flow and equity problems faced by the mixed enterprise farms. Many cattle are raised on mixed enterprise operations, with cattle being a secondary enterprise. As the farm sector faced a equity problem, because of both higher interest charges and lower farm values, a method to increase cash flow for the producers was to sell off parts of their cow herd. Incorporating this behavior in the model is very difficult from a statistical standpoint. Data on the equity problems of the industry are more

qualitative than quantitative. Another problem is that this change in the financial position of farmers has occurred in the 1980s, and the number of available observations may not yet be sufficient to statistically capture some of this resulting behavior. Within the framework of the quarterly modeling project, specific adjustments were made to account for some of these behavioral changes. These adjustments are based on qualitative information about the sector and judgmental factors determined by the analysts.

The second area in which large validation errors occur in the model relate to the price determination process. Over the past few years, there has been an ongoing argument about the changing demand for red meat and for beef in particular. Studies at the USDA, which use complete demand systems, have shown that about 95% of the variation of the demand for meat can be explained by prices and income (Haidacher et al., 1982). Other studies have argued that there has been a fundamental change in the demand for meat. These various arguments are based on increasing amounts of poultry consumed and on the flat levels of beef and pork consumption over the past few years.

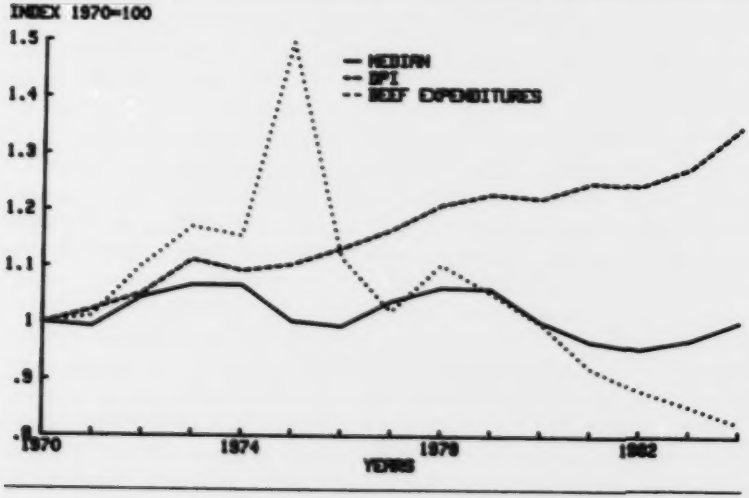
From an analyst's point of view, a more localized problem – one that may have spurred questions about the change in the demand for red meat – is the consistent overprediction of the U.S. price forecasting models under the conditions of level beef and pork consumption and rising income. Beginning about 1980, the equations forecasting meat prices, particularly beef prices, began forecasting increasing retail and farm prices. However, the market did not show any price strength. From 1980 to 1984, beef consumption remained flat, at the lowest levels on a per capita basis since 1965. Pork consumption also declined from about 69 pounds in 1980 to the 60-pound range. Poultry consumption continued to increase during this period until the market was faced with record per capita red meat and poultry consumption. Also, during this period, real per capita disposable income was increasing. So the factors impacting on the pricing equations were declining beef consumption, declining pork consumption, increasing poultry consumption and increasing real income.

Pricing equations for beef and pork naturally showed increasing prices during this period. Many individuals speculated on a change in the demand for red meats because of health concerns. A question that arose from this concept was why the change was apparently so abrupt. Some gradual change should be expected over time since the age distribution of the population was older and the caloric needs of older individuals are lower than average. Also, the

shifting of the work force from manufacturing to service-oriented jobs should gradually change the caloric needs of such individuals. A proposition presented in this paper is that the apparent weakness in beef prices may be a reflection of the weakening of family incomes.

A comparison of two separate measures of real consumer income, the disposable personal income from the National Income Accounts and the median family income from U.S. Bureau of Census survey data, is shown in Figure 5.4. Both of these data series are indexed from a base period of 1970, with the median family income data adjusted fol income from the National Income Accounts and the median family income from U.S. Bureau of Census survey data, is shown in Figure 5.4. Both of these data series are indexed from a base period of 1970, with the median family income data adjusted for family size but not for income tax. Real disposable personal income in 1983 was about 30% larger than it was in 1970. Median household income adjusted by family size was about 5% lower in 1983 than it was in 1970. Median household income was not

FIGURE 5.4 INCOME MEASURES AND BEEF EXPENDITURES, UNITED STATES, 1970-84

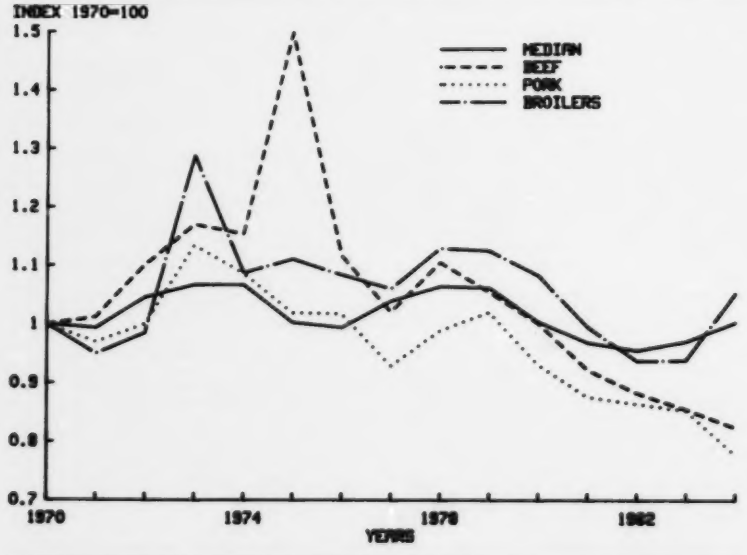


adjusted for taxes, which would give an even larger downward bias to the data, because of "tax bracket creep." Over the first few years of the 1970s, these two data sources followed the same general

pattern. Beyond the mid-1970s, these income measures patterns diverged.

An index of real per capita beef expenditures is shown in Figure 5.4, along with the two measures of income. Beef expenditures appear to have more closely followed the median real family income measure. The divergence of the beef expenditure from the median family income index in the 1973-76 period can be explained by high levels of beef consumption coupled with low levels of total meat consumption. During this period, the relative price of beef compared with that for both pork and broilers declined after several years of increases. From 1980 to 1983, there were record large levels of meat consumption coupled with reduced beef consumption, which may have caused the more rapid drop in expenditures in this period. Figure 5.5 shows the pork and broiler real expenditures along with median family income and beef expenditures. The patterns for all meat expenditures appear to have more closely followed real median family income than real disposable income.

FIGURE 5.5 MEDIAN INCOME AND MEAT EXPENDITURES, UNITED STATES, 1970-84



If median family income appears to be the better measure of consumer purchasing power, why are these data not used in the Quarterly Model? At present, we are faced with a predicament. Family income data are survey data, which are released in August of the year following the survey. They are also annual data with no quarterly breakdown that would be useful for the quarterly forecasting model. Consequently, the median family income measure is not very useful for application in the Quarterly Model.

At present, some researchers have decomposed disposable personal income into the various components to eliminate the interest component, under the assumption that the marginal propensity to consume meats from a dollar of interest income is quite small in the aggregate. This is a step in the right direction. However, the consuming unit – the family – faces many fixed expenditures, such as mortgage, rent payments and utilities, which need to to be accounted for in deriving a discretionary income number that may be more useful to forecasters of agricultural prices. Redefining our measure of consumer income may only be a partial solution to the issue of the demand for meats. Consumers are faced with real price increases for items that are necessities, and their purchases are fixed in the short run. The solution would be to incorporate the complete budgetary process of the household into the demand sector for meat products. If an examination of some of the new factors facing the consumer over the 1980s is made, then an intuitive argument that there has not been a dramatic shift in consumer reference for beef can be supported.

A comparison of the components of the consumer price index in 1984, base year 1967, shows the housing costs index at 361.7, fuel and utilities at 387.3, apparel and upkeep 200.2, new cars 208.5, motor fuel 370.7 and food at 302.9. The areas where the consumer has greater discretion as to the quantity or quality that they purchase – food, apparel and cars – have not increased as much as items such as housing and utility rates. In the short run, consumer purchases of items such as housing and energy are fairly fixed and adjustments are made in areas where there is some discretion over the quality or quantity of items purchased. If the median family income is a true measure of the consumers' ability to purchase goods and services and if certain consumption levels are relatively fixed in the short run, as family incomes decline in real terms and as the fixed purchases increase in real terms, then some reduction in other expenditures must take place.

If the example of beef expenditures is examined in this framework, an intuitive argument may be made that we may not have a change in the demand for beef, but rather a movement along the demand curve. A study at USDA has shown that meats are relative luxuries, compared with other food groups (Blanciforti and Green, 1983). Within the meat complex, beef has a higher expenditure elasticity than pork or poultry, with steaks and roasts having a much higher expenditure elasticity (Haidacher et al., 1982). As other family expenses rise in real terms and as real family income declines, meats in general and beef in particular will bear the brunt of the reduction in expenditures. If beef quantity is fairly inelastic in the short run, then the adjustment will be reflected in lower beef prices. Even as the per capita consumption of beef declines, if real incomes decline and if the other costs faced by families rise, logically the price of beef could have declined from a movement along the demand curve.

The work that needs to be done in the area of forecasting the agricultural sector, not just the beef sector, needs to focus on capturing the behavior of the consumer as well as the producer in developing forecasts. It is necessary to move more toward the development of complete demand systems to more fully recognize the budgeting processes of consumers.

Conclusion

The Quarterly Model at ERS is a means of tying together a picture of the agricultural sector for use by situation and outlook analysts. In general, the performance of the forecasting model is quite good. As with all models, it is constantly being further developed and improved. In the beef sector, the concern about model performance in the 1980s is important. A measure of financial stress within the industry has to be dealt within the modeling framework on the supply side. Further income measures that affect demand must be reexamined and reevaluated.

In relation to the Canadian beef sector, the response of the U.S. beef sector is very important. In analyzing the impacts of a beef stabilization policy on the Canadian beef sector, the assumptions about the behavior of U.S. consumers as reflected in the prices that would result are crucial. If the assumptions about the U.S. price of beef are not accurate, the degree to which the Canadian government must react with a support price may be misleading.

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6

Trade Implications of Canadian Stabilization Programs: Reality and Perception

*Larry Martin and Karl Meilke**

A fundamental issue which must be faced not only by researchers involved in policy simulation analysis but also by policy makers and those involved in trade disputes is the question of how producers respond to program provisions. A second and equally practical issue has to do with whether economic researchers can ever have the imagination to represent the hodgepodge of Band-Aids, handouts, regional attempts to buy market share, and politicians' attempts to buy votes which makes up this country's so-called stabilization policy. If you cannot conceive of it and if you cannot quantify it, you certainly cannot analyze it objectively.

In this paper, we attempt to address the issue of modeling Canadian supply response to stabilization programs and to give some initial indications of their effects on the U.S. market. Perhaps we will do no more than define the problem; we certainly have not solved it.

We have done less than we were directed to do for this modeling workshop and, at the same time, we have tried to do more. Regarding the "less" part, we have not forecast into the future. Rather, we have chosen to focus on historical simulations from 1973 through 1982 in order to examine the estimated supply and trade impacts of stabilization programs. Thus in the beef component of our model, a historical base simulation and three policy scenarios were run. These consist of one simulation with only a cow-calf

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stabilization program, one with only a slaughter cattle program and one with both. We also present a deficiency payment simulation for the hog sector. The results of this latter are compared with the results of an attempt by Martin and Goddard (1985) to estimate Canadian producers' reactions to federal and provincial stabilization payments in the hog sector, which was conducted in response to the U.S. imposition of countervailing duties on Canadian hogs and pork.

Overview of the model

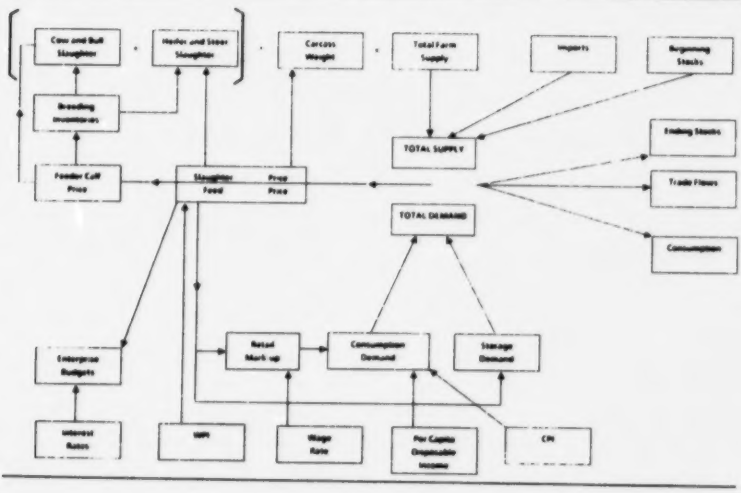
The model used to conduct the simulation experiments is a quarterly model of the beef and pork sectors for Canada and the United States. The specification of the model is based on previous work by MacAulay (1976), Haack (1978), Goddard (1977), Coleman (1984), Martin and Zwart (1975), and Robertson (1980). A description of the model, including the estimated equations, validation statistics and data sources is contained in the report by Meilke and Coleman (1985). The basic model, in the form used for this study, contains 51 equations solving for 51 endogenous variables. Of these, 21 are estimated behaviorally for the beef market and 11 for the pork market. In addition, 20 identities are needed to close the model, and approximately 30 accounting identities were added to the model to calculate the information needed to evaluate the impact of the stabilization programs. The model coefficients are estimated using the ordinary least squares statistical method, although Coleman, and Meilke and Coleman also use two-stage least squares estimates of the parameters. In Meilke and Coleman, nearly all of the equations were estimated using the fourth quarter of 1980 as the end of the estimation period. For the present analysis, some of the equations were reestimated through the fourth quarter of 1982. However, all of the reported elasticities were taken from the model as reported by Meilke and Coleman.

Both the beef and pork models are highly aggregated. For example, beef demand is not differentiated by quality, heifer and steer slaughter is not differentiated by sex and data for eastern and western Canada are combined except for cow and bull inventories, cow and bull slaughter and feeder calf prices. In addition, the feeder calf market is represented only by the feeder calf price. In the pork market, hog slaughter (East, West, U.S.) is estimated directly and no attempt is made to give a more disaggregate, analysis of supply response.

While there are strong arguments favoring a less aggregate specification, our efforts in this regard were disappointing. This was particularly true with regard to attempts to estimate heifer and steer slaughter individually.

On the positive side, the model does seem to capture the basic dynamics of the beef and pork cycles. In a 10-year dynamic simulation of the model, the quantity variables tended to validate best (except for trade flows), although steer and hog price estimates tended to be below actual prices during peaks in the cycle and above actual prices during troughs. In addition, there is a disturbing tendency for the model to substantially overpredict all prices during the last 2 years of simulation. Table 6.1 shows the root mean square percentage errors (RMSPE) for the somewhat more comprehensive model used by Meilke and Coleman, while Figure 6.1 provides a schematic representation of the beef market for a particular region.

FIGURE 6.1 REGIONAL BEEF MODEL



The major determinant of beef supply is the inventory of beef cattle. The annual (January 1) inventory of beef cows and bulls is specified as an unconstrained distributed lag of the annual average real (using the wholesale price index as a deflator) price of feeder calves with lags from t−1 to t−6. The direct price elasticity estimates in Table 6.2 show that inventories in the long run are quite responsive to price changes, with elasticities close to 1. The

TABLE 6.1 ROOT MEAN SQUARE PERCENTAGE ERRORS FOR A DYNAMIC SIMULATION, 1972 Q1 TO 1980 Q4

Variable	RMSPE	Variable	RMSPE
Steer slaughter beef		**Feeder calf price**	
Can.	2.79	West	20.50
U.S.	2.24	East	18.18
		U.S.	21.57
Disappearance of beef			
Can.	5.10	**Hog price**	
U.S.	3.78	West	14.57
		East	12.10
Disappearance of pork		Can.	12.90
Can.	4.85	U.S.	16.60
U.S.	6.31		
		Steer price	
Cow and bull slaughter		West	13.57
West	15.08	East	11.59
East	14.98	Can.	12.64
U.S.	16.49	U.S.	12.75
Heifer and steer slaughter		**Beef price, retail**	
Can.	7.73	Can.	14.33
U.S.	4.13	U.S.	10.43
Cow and bull inventory[a]		**Pork price, retail**	
West	5.76	Can.	6.12
East	2.68	U.S.	8.94
U.S.	3.42		
		Beef production	
Closing stocks of beef		Can.	6.44
Can.	10.49	U.S.	4.10
U.S.	14.36		
		Pork production	
Closing stocks of pork		West	7.23
Can.	15.24	East	3.53
U.S.	13.19	U.S.	6.34
Net trade, beef (Canada/U.S.)	230.91	**Consumer price index, Can.**	1.57
Net trade, pork (Canada/U.S.)	861.28	**Wholesale price index, Can.**	4.50
		Corn price, Can.	6.46
		Barley price, Can.	9.08

[a] based on annual data

inventory of dairy cows, which is treated exogenously, is added to the beef cow and bull inventory, and this variable becomes a major determinant of cow and bull slaughter as well as of heifer and steer slaughter.

TABLE 6.2 DIRECT PRICE ELASTICITIES (BEEF)

	Short run	Long run
Beef demand, Can.[a]		−0.46
Beef demand, U.S.[a]		−0.80[b]
Cow and bull inventory		
West[c]	0.09	0.91
East[c]	−0.01	1.23
U.S.	0.09	0.94
Cow and bull slaughter		
West[c]	−0.26	−0.57
East[c]	−0.16	−0.45
U.S.[c]	−0.23	−0.70
Heifer and steer slaughter		
Can.[d]	−0.44	0.24
U.S.[d]	−0.15	0.16
Average carcass weight		
Can.[c]	0.02	0.12
U.S.[c]	0.05	0.33
Elasticities of price transmission		
Farm price to retail price		
Can.	0.66	1.14
U.S.	−0.57	0.85
Steer price to feeder calf price		
West	0.91	1.57
East	0.75	1.60
U.S.	0.66	1.90
U.S. steer price to western steer price	0.77	0.98
U.S. steer price to eastern steer price	0.75	0.96

[a] retail price of beef deflated by the CPI
[b] price flexibility
[c] price of feeder calves deflated by the WPI
[d] farm price of steers deflated by the WPI

Quarterly cow and bull slaughter during the calendar year depends on the inventory of cows and bulls the previous January and the real price of feeder calves during the current quarter. These functions tend to have direct price elasticities around –0.25 in the short-run and –0.50 in the long run.

Quarterly heifer and steer slaughter depends on inventories approximately 2 years earlier: the current real price of steers and a simple average of the real price of steers in quarters t – 1 through t – 3. The real price of grain both currently and for quarters t – 1 through t – 3 also affects heifer and steer slaughter. As shown in Table 6.2, the current price of steers enters the heifer and steer slaughter equations with a negative sign. In Canada, the short-run elasticity of –0.44 is about three times as large as that for the United States. The long-run price elasticity is, however, positive and the elasticities in the two countries are similar.

Cow and bull and heifer and steer slaughter are estimated in terms of animal numbers. This quantity is converted to pounds of beef by multiplying by the average carcass weight. The average carcass weight is determined behaviorally as a function of the real price of steers and the real price of feed grains lagged one quarter.

The demand for beef is estimated using a rather standard specification in terms of the real retail price of beef (deflated by the consumer price index), the real retail price of pork and real disposable income. In the United States, the demand curve has been renormalized on price. The relevant direct price elasticity for Canada and the direct price flexibility for the U.S. is given in Table 6.2. The retail price of beef is obtained from a farm price to the retail price markup equation.

Having determined the total supply and total demand of beef in both Canada and the United States, the net trade in beef between the two countries is equated to determine the farm price of steers in the United States. The farm prices of steers in eastern and western Canada are then linked to the U.S. price. Feeder calf prices in all three regions are specified as functions of the current price of steers and the current price of feed in the relevant regions. These prices then feed back into the cow and bull inventory equations.

The pork market is considerably simpler than the beef market. Demand is estimated in the same way as for beef and the direct price elasticity (Canada) and direct price flexibility (U.S.) are shown in Table 6.3. Hog slaughter in all three regions is determined directly using a geometric distributed lag model with four quarter lags on both real hog prices and real grain costs. The estimated short-run elasticities of supply are all very inelastic (0.10 to 0.19) but are much larger in the U.S. and western Canada in the long run. Eastern Canada is by far the least price-responsive market in the long run.

Net trade in pork between Canada and the United States is equated to determine the U.S. farm price of hogs, with hog prices in eastern and western Canada linked to the U.S. price.

TABLE 6.3 DIRECT PRICE ELASTICITIES, PORK

	Short run	Long run
Pork demand		
Can.[a]		−0.78
U.S.[a]		−0.84[a]
Hog slaughter		
West[c]	0.19	1.36
East[c]	0.10	0.28
U.S.[c]	0.12	0.92
Elasticities of price transmission		
Farm price to retail price		
Can.	0.34	0.52
U.S.	0.41	0.63
U.S. hog price to western hog price	0.80	1.01
U.S. hog price to eastern hog price	0.75	0.86

[a] retail price of pork deflated by the CPI
[b] price flexibility
[c] farm price of hogs deflated by the WPI

Simulation procedure

All simulations were run historically from the second quarter of 1973 through the fourth quarter of 1984. Program payments were based on the formulae provided in the terms of reference provided for the workshop, but payments were generated endogenously by the model, and the wholesale price index, rather than the GNE deflator, was used as the deflator in determining the payments.

It was assumed in the policy simulations that producers would react to the deficiency payments in the same way as they would to a price increase. Consequently, deficiency payments in the cow-calf sector raise the perceived price of feeder calves, which then influences cow and bull inventory and slaughter decisions. Payments in the slaughter program affect heifer and steer slaughter, feeder calf prices and, with a lag, the level of inventories. Payments in the hog program affect hog slaughter with a 4-quarter lag.

It should be noted that in running the simulations no account was taken of the possibility that the stabilization program may shift the supply curves to the right as a result of risk reduction. In addition, producers' price expectations mechanisms were assumed to remain unchanged, with and without the program. This clearly runs counter to the so-called Lucas critique and probably to common sense as well. The Lucas critique of modeling policy changes refers to the possibility that new policies may change the behavior of producers (and consumers). In this case, a new stabilization program would likely affect producer reactions significantly. Since stabilization payments were made infrequently over the estimation period, it seems likely that we have underestimated the supply response to a timely stabilization program where producers either know or can easily anticipate the floor price.

Results of the beef simulations

Selected results of the simulations are presented below in graphical form to show the pattern of change relative to the base simulation. Subsequently, summary statistics are presented in tabular form and the impacts of the programs are compared.

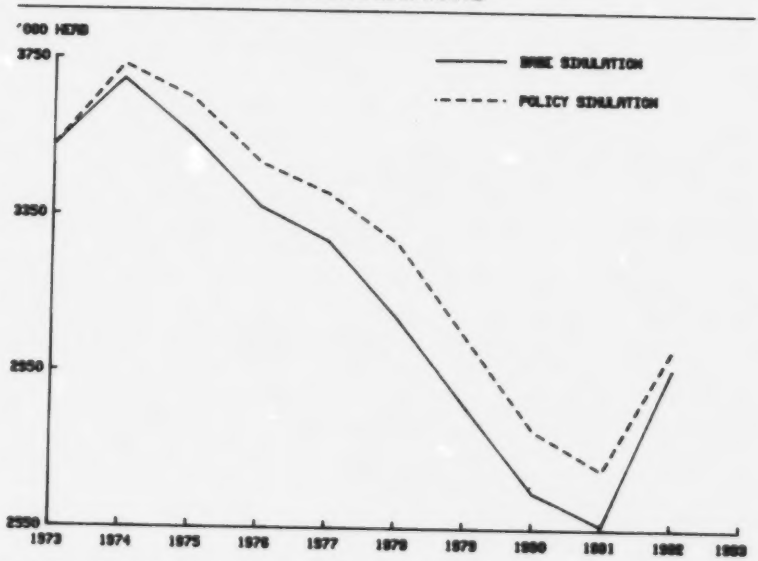
The model does a good job of tracking the market until 1977. Thereafter, it underestimates the magnitude of the price rise in 1978-79 and overestimates prices thereafter. This has a decided effect on the pattern of payments. The cow-calf program calls for payments during the period of depressed market prices and/or high feed grain prices in 1974-76. Similarly, the slaughter program calls for payments during the depressed period of 1974-77, but not during the early 1980s. It also would have provided payments in 1978, an outcome that is inconsistent with reality. Moreover, there is a weakness in the design of the program we were asked to simulate, in that it does not include interest rates, which would have been important during the latter part of the simulation period. Payments range from $0.80/cwt to $6.30/cwt for the slaughter program and from $4.75/cwt to $12.11/cwt for feeders.

Figures 6.2 to 6.6 illustrate the base and program simulations for the joint cow-calf and slaughter cattle program for each of the following: western breeding inventory, total beef production, Canada's net trade with the U.S., western prices of feeders, and western prices of steers (the model also generates prices for eastern Canada, the results of which, in terms of the patterns of adjustment, are similar to those for the West). Tables 6.4 to 6.6 contain summary data for all three programs, that is, cow-calf only, slaughter only and joint cow-calf and slaughter.

Breeding inventories

Since payments in all three simulations would have been made early in the simulation period, the pattern of adjustment in breeding inventories is quite similar. Breeding inventories relative to the base run would have increased in each case. The increases build up until 1978 or 1979 and decline thereafter, indicating a tendency to return toward the base values (Figure 6.2).

FIGURE 6.2 WESTERN CANADA INVENTORY OF BEEF COWS AND BULLS, BASE AND JOINT SLAUGHTER CATTLE AND COW-CALF PROGRAM SIMULATIONS



It is interesting to note that, despite substantially lower program costs, the slaughter cattle program has a larger impact on breeding inventories than does the cow-calf program (Table 6.4). Slaughter cattle payments feed through the price transmission equations to affect feeder prices. These in turn affect breeding inventories. With a relatively large elasticity of price transmission in the feeder calf equations and quarterly payments, it would appear that the payoff from a slaughter program would be high.

TABLE 6.4 SUMMARY DATA FOR BEEF STABILIZATION PROGRAMS, COSTS AND QUANTITIES, 1973-82

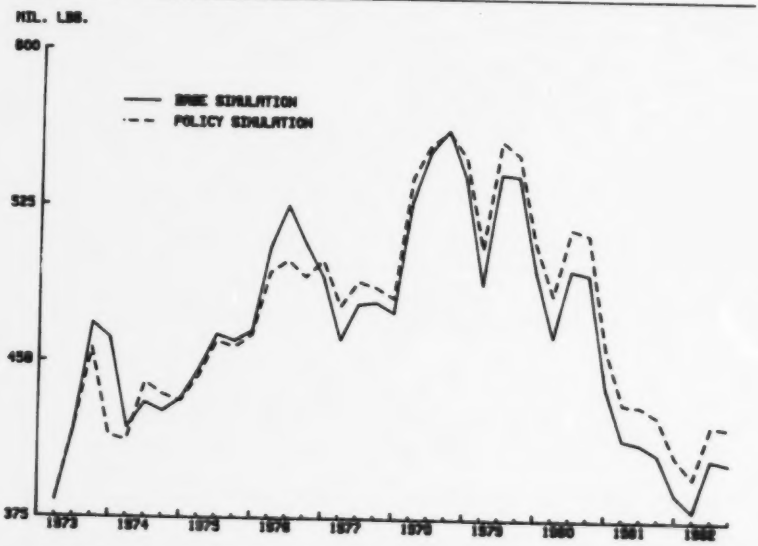
Variable	Cow-calf[a]			Slaughter cattle			Combined		
	Change			Change			Change		
	Actual	Percent	Response[b]	Actual	Percent	Response[b]	Actual	Percent	Response[b]
	($ million)								
Total program costs (1973–82)	409.7	N/A		173.5	N/A		CC off 302.3 Slaug 176.3 478.6	N/A	
	(thousand head)								
Breeding inventory (yearly average)									
West	41.7	1.3	0.0013	77.8	2.5	0.0054	109.2	3.5	0.0028
East	11.0	1.6		16.1	2.3		24.4	3.5	
U.S.	−4.8	−0.01		−9.2	−0.02		−13.4	−0.3	
	(million pounds)								
Quantity of beef produced (yearly average)									
Canada	10.4	0.6	0.25	13.7	0.7	0.94	21.8	1.2	0.45
U.S.	0.3	0.001		2.7	0.01		2.8	0.01	
Net trade with U.S. (yearly average)	8.7	15.1%	0.21	11.8	20.4	0.68	18.6	32.2	0.39

[a] In calculating the costs of the program, it was assumed that deficiency payments were not made on dairy calves and that the payment was made on 500-pound calves.
[b] Quantity change per dollar of program cost.

Quantity of beef produced

All three programs would have resulted in lower beef production during the early part of the simulation period and in increased production thereafter (Figure 6.3). This result is, of course, the converse of the pattern for the breeding inventory; as cows and heifers are held for the breeding herd, fewer are slaughtered and, subsequently, the larger beef herd gives rise to increased slaughter of steers, heifers and culls.

FIGURE 6.3 CANADIAN BEEF PRODUCTION, BASE AND JOINT SLAUGHTER CATTLE AND COW-CALF PROGRAM SIMULATIONS



Both the slaughter and combined programs would have caused beef production to decline during 1981 and 1982. This would be due to payments in 1978, which again have the effect of increasing the breeding herd and reducing subsequent slaughter.

Trade in beef

The base run has Canada as a net exporter of beef until 1981 and a net importer thereafter (Figure 6.4). All three simulation programs would have resulted in lower exports until 1977 but in either higher exports or lower imports thereafter (Table 6.4). As with breeding inventories, the slaughter program would have had a much greater impact on trade than the cow-calf program.

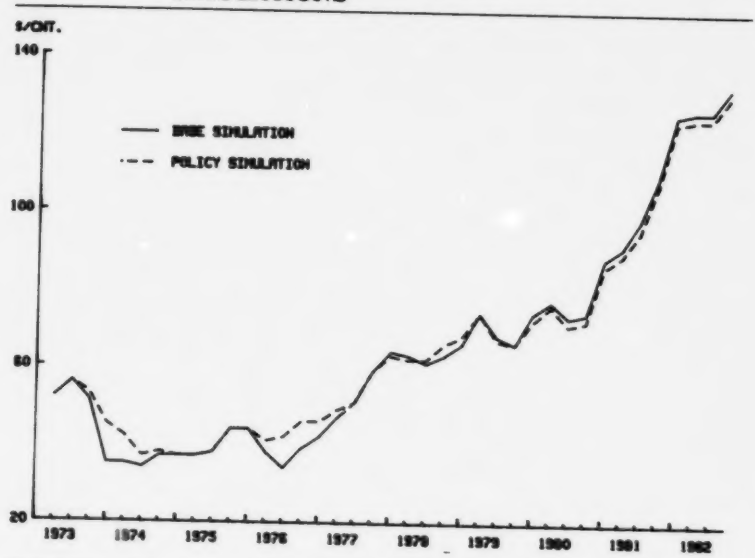
FIGURE 6.4 CANADIAN NET EXPORTS OF BEEF, BASE AND JOINT SLAUGHTER CATTLE AND COW-CALF PROGRAM SIMULATIONS

Prices of steers and feeders

Not surprisingly, all three programs would have caused Canadian steer prices to decline because of the associated increase in production (Figure 6.5 and Table 6.5). Moreover, the slaughter and joint programs would have had a larger effect. However, none would have a substantial impact.

All three programs would have resulted in higher market prices for feeders in the early years, as steer prices rise because of reduced beef supplies and/or stabilization payments for slaughter cattle

FIGURE 6.5 WESTERN CANADIAN PRICE OF FEEDER CALVES, BASE AND JOINT SLAUGHTER CATTLE AND COW-CALF PROGRAM SIMULATIONS



(Figure 6.6). But feeder prices would have declined in later years because of lower steer prices and larger breeding herds.

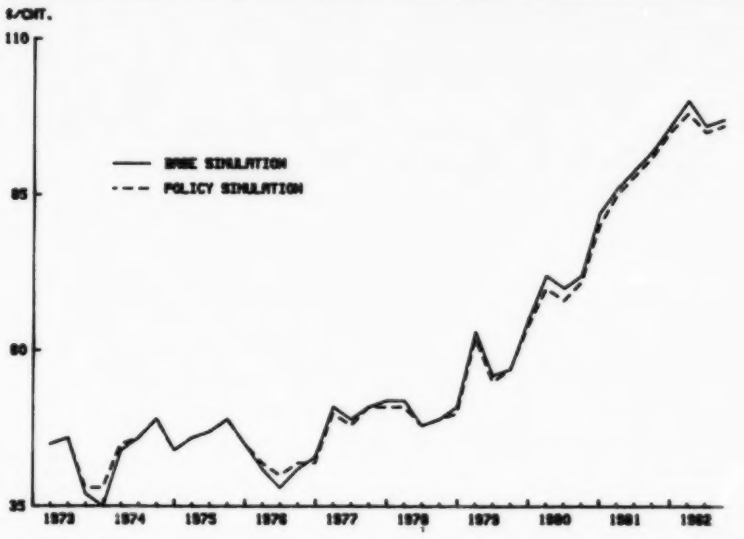
Summary data

Program costs for the slaughter cattle program are less than half those for the cow-calf and joint programs. Note that the cost for the cow-calf component of the joint program is lower than that for the cow-calf program only. This is because payments to slaughter animals result in higher feeder prices and therefore in lower deficiency payments for feeders.

On the other hand, costs for the slaughter component of the joint program are higher than those for the slaughter program by itself. This is due to the lower steer prices in the simulation.

The slaughter program has a larger impact on the average breeding herd than the cow-calf program because of the frequency and timing of payments. While the primary objective of Canada's

FIGURE 6.6 WESTERN CANADIAN PRICE OF STEERS, BASE AND JOINT SLAUGHTER CATTLE AND COW-CALF PROGRAM SIMULATIONS



stabilization program is not to increase supply, it would have this effect as a result of raising producers' prices during periods of low profit margins. Consequently, the output response per dollar of program payments, shown in Table 6.4, provides a rough measure of how successful the different programs would be in keeping producers in business. It must be noted, however, that response to the program payments would continue for some time beyond the end of the simulation period.

With this caveat, the increase in breeding inventory per dollar of program cost would be much greater for the slaughter program than for the other two. As noted earlier, the programs would have had both negative and positive impacts on beef production and trade. So the average adjustment would be quite small, but positive for all three programs. However, the slaughter program again reveals the largest response in terms of pounds of meat produced or traded per dollar of program cost.

TABLE 6.5 EFFECT OF BEEF STABILIZATION PROGRAMS ON PRICES, 1973-82

Variable	Change from base					
	Cow-calf		Slaughter		Combined	
	($/cwt)	(%)	($/cwt)	(%)	($/cwt)	(%)
Market price of steers						
Western Canada	−0.18	−0.3	−0.25	−0.4	−0.39	−0.7
U.S.	−0.02	−0.04	−0.04	−0.07	−0.06	−0.1
Market price of feeders						
Western Canada	−0.30	−0.4	0.84	1.3	0.62	0.9
U.S.	−0.04	−0.06	−0.09	−0.1	−0.12	−0.2
Market price plus deficiency payment for feeders						
Western Canada	0.36	0.5	0.84	1.3	1.10	1.7

It is of interest to compare the effect on net trade with the size of the U.S. market. The richest of the three programs would have increased Canada's trade balance with the U.S. by an average of 18.6 million pounds per year. The model estimates average U.S. consumption at 25 billion pounds. Thus, on average, the estimated effect of this program would have to have caused U.S. consumption to increase by less than 0.1% and slaughter cattle prices to fall by less than 0.1%. Remembering that the time pattern included both positive and negative adjustments, the maximum impact would have increased Canada's net trade balance by 80 million pounds, which is still less than 0.1%. The maximum quarterly effect on U.S. slaughter cattle prices would have been 0.5%.

Therefore, even if payments had been higher and if there had been a positive risk response, Canadian stabilization programs would have had only a small impact on the U.S. market.

Table 6.5 contains the effects of the simulation programs on average market prices of steers and feeders. They are negligible.

The last row of Table 6.5 is interesting; it shows the average of the market price of feeders and the deficiency payments for the cow-calf program. The addition of the two is an average gross return per hundredweight of feeders from both the market and the programs. Note that the lower-cost slaughter program yields a higher average combined price for feeders than the higher-cost

cow-calf program, although this is not as high as for the quite costly combined program.

Table 6.6 contains the coefficients of variation associated with the affected variables for Canada. There are two inferences. The first is that not much stability is imparted, even in terms of the trigger variable (margin above feed costs). The second is that the slaughter-only program is the most efficient in imparting it.

TABLE 6.6 STABILITY IMPACTS OF ALTERNATIVE BEEF PROGRAMS

Variable	Coefficients of variation			
	Base run	Cow-calf program	Slaughter program	Combined program
	(percent)			
Canadian steer price (excl. deficiency payment)	31.8	31.6	31.3	31.2
Canadian steer price (incl. deficiency payment)	31.8	31.6	30.1	29.9
Western feeder calf price (excl. deficiency payment	43.7	43.3	40.7	40.3
Canadian net beef exports	231.6	200.7	176.7	162.9
Canadian beef production	10.7	10.7	10.4	10.4

The most obvious conclusion from these simulations is that the programs would not have much impact and, at least compared with Canadian dairy policy, they would not be very costly! But perhaps the patterns of adjustment are of interest.

Second, even if the simulation understates the cost of and absolute response to the programs, it is probably safe to conclude that the rising protest of U.S. beef producers about unfair trade practices in Canada is unwarranted. It would take a lot of Canadian money to cause material injury to the U.S. market. Moreover, our model, while not accounting for risk response, does assume that the programs are timely and ongoing, that the rules are known and do not change, that all producers are enrolled and that the government pays the entire cost. None of these assumptions fits reality. So we have likely overestimated the response to the actual stabilization programs in place during the simulation period.

Finally, the rather remarkable relative response of the slaughter cattle program adds further evidence to our long-held suspicion that a cow-calf program is unnecessary, assuming the existence of a well-designed, timely, quarterly program for slaughter cattle. Feedlot operators will willingly share a goodly portion of timely deficiency payments with cow-calf operators when it comes time to refill their feedlots.

Results of the pork simulation

Like the beef component of the model, the hog component underestimates hog prices during the mid-1970s and overestimates them during the early 1980s. This likely affects the level and timing of payments. Clusters of payments would have been generated in 1974 and in 1979-80. In the former period, payments would have ranged from $0.19/cwt to $8.38/cwt, while they would have been $3.60/cwt to $6.15/cwt in the latter period. Both periods yielded depressed returns in the real world.

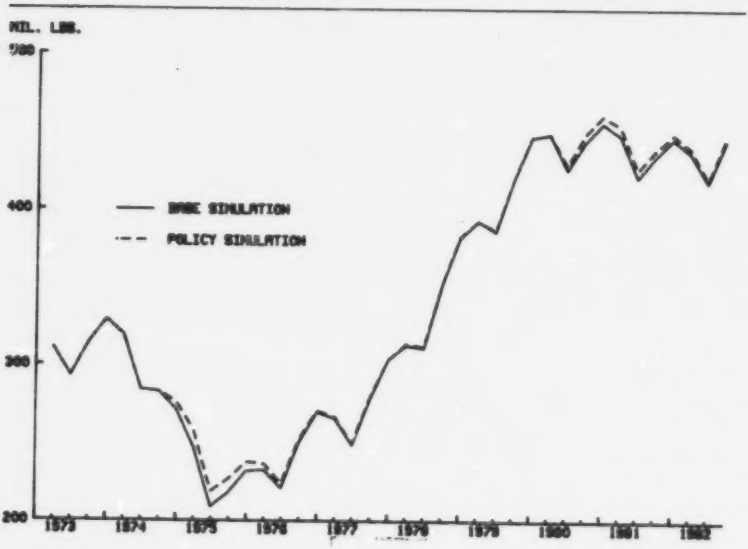
Figures 6.7 to 6.9 contain graphs showing the impacts on hog market variables. Canadian pork production would have increased throughout the simulation period, with the largest effects being around 10 million pounds per quarter in 1975 or about 4% of production (Figure 6.7). Note that by 1978 production with the program would have been back almost to the same level as that without the program.

Net trade in pork with the U.S. would have increased throughout the simulation period (Figure 6.8). Its pattern would have been similar to that for hog production. Market prices for hogs would have declined slightly during the period (Figure 6.9).

Table 6.7 contains summary data for the simulation. As with the beef programs, program costs would have been relatively low and the market impacts would have been small. Total costs would have been $144.1 million. Canadian exports to the U.S. would have increased by 8.2 million pounds per year, or about half a pound per dollar of program cost per year. This brings us to the potential injury of the program to the U.S. market. The model generates average annual consumption in the U.S. of 1.47 billion pounds per year. Thus the increased exports average about 0.06% of U.S. production. The maximum increase in Canadian exports in any quarter would be 8.8 million pounds or about 0.02% of U.S. consumption and the maximum quarterly impact on the U.S. price of hogs would be less than 0.5%.

Table 6.8 shows the stability impacts of the hog program. Again the effects are small, although the coefficient of variation on the

FIGURE 6.7 CANADIAN PORK PRODUCTION, BASE AND DEFICIENCY PAYMENT PROGRAM SIMULATIONS

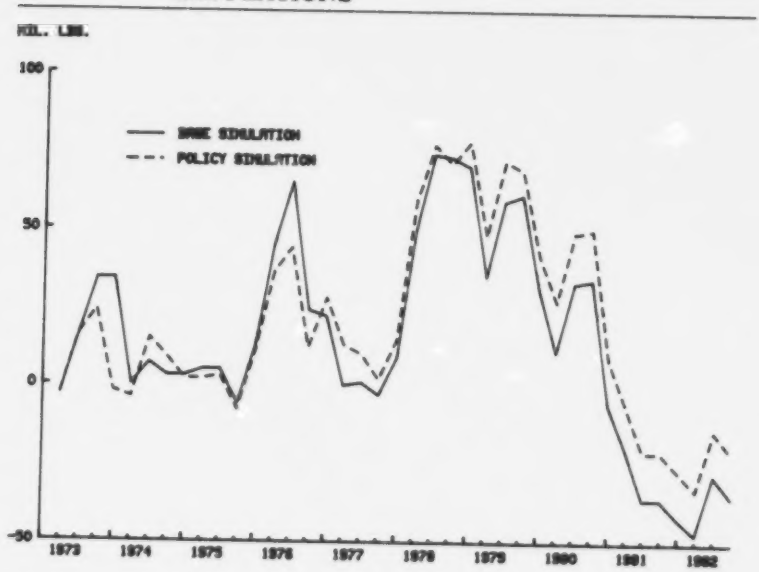


margin above feed costs does decline by 13.7% with the deficiency payment program.

Estimating the response to stabilization payments for hogs

The federal Agricultural Stabilization Act has now been amended for 10 years and a few payments have been made. Moreover, a number of provinces have introduced stabilization or income assurance programs for hog producers. These programs have led to a countervailing duty action against Canada by the U.S. National Pork Producers Council and several U.S. packers. Given that a considerable amount of historical data is available and given that Canada's stabilization programs function differently from the well-enunciated programs we have been asked to simulate, Martin and Goddard (1985) attempt to estimate the "true" supply response to Canada's stabilization programs in each province.

FIGURE 6.8 CANADIAN NET EXPORTS OF PORK, BASE AND DEFICIENCY PAYMENT PROGRAM SIMULATIONS



All of the estimated supply equations employ an adaptive expectations approach, as does the model reported above. Unlike Coleman's model, 5-quarter lags are used, because they give slightly better results. The variances of hog and feed grain prices are also included in the equations to test for risk response. All prices are in real terms, and representative results for each province are reported in the first two equations of Tables 6.9 to 6.15. Interestingly, the estimates during this period imply little response to real hog prices, a negative response to feed grain prices, and large and significant coefficients on the lagged dependent variables.

When the net stabilization payments (equation 3) are included as a separate variable in the equations, no significant response to the payments is found in any province. These results are quite interesting and somewhat counterintuitive. Therefore, in order to further test for causality between payments and Canadian hog production, the equations are reestimated in first-difference form to

FIGURE 6.9 CANADIAN HOG PRICE, BASE AND DEFICIENCY PAYMENT PROGRAM SIMULATIONS

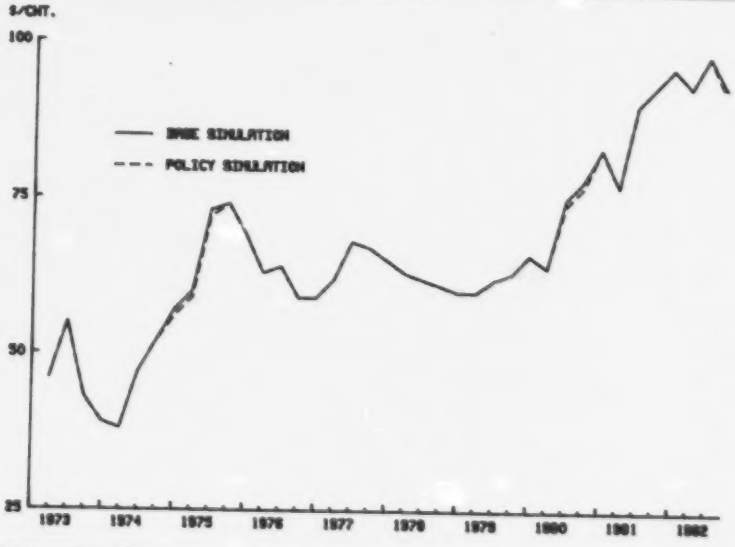


TABLE 6.7 SUMMARY DATA FOR SIMULATION OF THE HOG STABILIZATION PROGRAM, 1973-1982

Variable	Canada			U.S.	
	Change			Change	
	Actual	%	Response[a]	Actual	%
Cost of program (1973-82)	Can$144.1 mil	N/A	N/A	N/A	N/A
Net trade with U.S. (yearly average)	8.2 mil lb	N/A	0.57 mil lb	N/A	N/A
Pork production (yearly average)	9.92 mil lb	0.5	0.69 mil lb	-3.9 mil lb	-0.02
Market price of hogs	Can$0.19/cwt.	-0.3	N/A	U.S.$0.02/cwt	-0.04

[a] per dollar of program cost

TABLE 6.8 STABILITY IMPACTS OF HOG PROGRAM

Variable	Coefficient of variation	
	Base run	Program run
Canadian hog price (excl. deficiency payment)	22.9	22.9
Canadian hog price (incl. deficiency payment)	22.9	21.4
Canadian net pork exports	45.6	45.3
Canadian pork production	24.4	24.0
Hogs		
Margin above variable costs (excl. deficiency payment)	37.4	37.3
Margin above variable costs (incl. deficiency payment)	N/A	32.2

remove the apparent trend in the data. The results are shown in equations 4 and 5 of the tables. The results indicate that the conclusions from above are essentially unchanged, except in Manitoba and the Atlantic provinces.

The above results lead to a crucial question. Why are Martin and Goddard unable to find significant responses to market prices and stabilization payments? A rather standard answer to this question would be that something important in determining supply response has been left out of the analysis. But what is this something else?

We suggest one factor could be supply management in Canada's dairy and poultry sectors, which has restricted entry into and expansion of production in these sectors,allowed investment in pork production to reduce income taxes on profitable dairy and poultry production, and increased pressure to initiate supply management for hogs. This latter feature has encouraged dairy and poultry producers to invest in hog facilities in the hope that hog quota would take on value as it has for milk and poultry quota. It has also contributed to decisions of committed hog producers not to decrease output for fear of not obtaining quota. Or the missing factor may be the design of many of the stabilization programs, where the floor price level is somewhat arbitrary and where payments are untimely. These two factors make it difficult for producers to incorporate the program into their decision making.

TABLE 6.9 REGRESSION RESULTS FOR HOG MARKETINGS, BRITISH COLUMBIA, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	−401.92 (−0.38)		−787.73 (−2.00)		0.90 (12.82)		0.92 76.2
2	−408.55 (−0.36)	96.16 (0.04)	−792.02 (−1.19)	−180.82 (−0.05)	0.90 (11.51)		0.92 53.45
3	−384.72 (−0.30)		−797.49 (−1.72		0.90 (12.32)	72.30 (0.03)	0.92 63.2
4[c]	−549.00 (−0.39)		−446.90 (−0.33)		0.78		−0.03 0.82
5[c]	−363.90 (−0.23)		−487.60 (−0.35)		0.78	766.80 (0.29)	−0.05 0.68

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.10 REGRESSION RESULTS FOR HOG MARKETINGS, ALBERTA, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	484.85 (0.18)		−3823.84 (−3.21)		0.77 (6.84)		0.85 35.17
2	252.01 (0.08)	1720.52 (0.29)	−4309.10 (−2.31)	−1628.31 (−0.18)	0.78 (6.63)		0.84 24.80
3	1188.67 (0.38)		−3868.90 (−3.99)		0.78 (6.77)	5199.80 (0.52)	0.74 29.47
4[c]	4110.30 (1.11)		−8434.70 (−2.36)		0.63		0.48 7.60
5[c]	4716.90 (1.16)		−8221.50 (−2.24)		0.65	3319.30 (0.39)	0.46 6.20

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.11 REGRESSION RESULTS FOR HOG MARKETINGS, SASKATCHEWAN, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	920.26 (0.71)		−2236.60 (−3.99)		0.61 (5.06)		0.73 18.01
2	202.23 (0.13)	2978.18 (0.96)	−3344.59 (−3.30)	−2352.80 (−0.48)	0.59 (4.37)		0.73 13.68
3	−353.30 (−0.23)		−2113.10 (−3.81)		0.58 (4.85)	−12126.90 (−1.54)	0.75 16.46
4[c]	2817.90 (1.24)		−3280.30 (−1.45)		0.79		0.43 6.5
5[c]	2793.00 (1.15)		−3280.60 (−1.43)		0.79	−280.30 (−0.03)	0.43 5.2

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.12 REGRESSION RESULTS FOR HOG MARKETINGS, MANITOBA, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	757.24 (0.38)		−2155.70 (−2.47)		0.92 (11.09)		0.91 63.41
2	445.31 (0.21)	4861.75 (1.22)	−2980.01 (−2.14)	−7477.58 (−1.16)	0.90 (10.64)		0.91 46.96
3	1301.55 (0.64)		−2280.50 (−2.61)		0.91 (11.08)	30539.20 (1.14)	0.91 55.07
4[c]	3260.40 (1.24)		6922.20 (2.77)		0.628		0.43 6.50
5[c]	3885.60 (1.50)		−6861.20 (−2.83)		0.71	30459.10 (1.69)	0.46 6.20

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.13 REGRESSION RESULTS FOR HOG MARKETINGS, ONTARIO, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	−634.51 (−0.91)		−5622.80 (−1.97)		0.88 (11.28)		0.92 73.29
2	−379.00 (−0.05)	2465.34 (0.18)	−4824.47 (−1.24)	−4123.52 (−0.33)	0.86 (10.10)		0.92 51.19
3	251.97 (0.04)		−6234.20 (−2.16)		0.86 (11.03)	74744.00 (1.15)	0.92 62.79
4[c]	16228.90 (1.76)		−5429.90 (−1.14)		0.67		0.36 5.10
5[c]	16286.50 (1.74)		−5489.20 (−1.13)		0.69	11849.40 (0.26)	0.34 4.10

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.14 REGRESSION RESULTS FOR HOG MARKETINGS, QUEBEC, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	2838.10 (0.30)		−5153.30 (−1.51)		0.91 (11.06)		0.91 67.24
2	3844.63 (0.38)	−7550.26 (−0.44)	−2605.04 (−0.56)	2821.47 (0.17)	0.89 (8.73)		0.91 48.33
3	3373.70 (0.34)		−5323.70 (1.53)		0.91 (10.80)	42017.10 (0.38)	0.91 56.07
4[c]	15155.50 (1.31)		−329.70 (−0.06)		0.64		0.28 3.70
5[c]	14820.80 (1.24)		−259.10 (−0.04)		0.63	−11885.70 (0.16)	0.25 3.00

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

TABLE 6.15 REGRESSION RESULTS FOR HOG MARKETINGS, ATLANTIC PROVINCES, 1975 Q2 TO 1984 Q3 (t-STATISTICS IN PARENTHESES)

Equation	Hog price[a]	Variance of hog price	Feed price[a]	Variance of feed price	Lagged dependent variable[b]	Stabilization payments	R^2 (F-Statistics)
1	−101.70 (−0.14)		−443.70 (−1.64)		0.95 (17.31)		0.96 149.30
2	−59.83 (−0.08)	−201.88 (−0.15)	−401.94 (−1.04)	136.78 (0.11)	0.95 (15.75)		0.96 104.87
3	−187.60 (−0.17)		−430.30 (−1.42)		0.95 (16.89)	−203.70 (−0.10)	0.96 123.90
4[c]	559.93 (0.71)		−235.00 (−0.51)		0.58		0.56 10.20
5[c]	2412.70 (2.10)		−238.70 (0.55)		0.60	3241.50 (2.13)	0.60 10.20

[a] lagged five quarters
[b] provincial marketings, lagged one quarter
[c] first differences

Summary, conclusions and implications

This paper has attempted to address the question of the usefulness of econometric modeling for the analysis of the impacts of Canadian stabilization programs, especially their impacts on trade with the U.S. The analysis was carried out in two phases. In the first, three stabilization programs for the beef sector (one with payments to cow-calf producers, a second with payments to feedlot operators and a third with payments jointly to cow-calf and feedlot operators) and one for the pork sector were simulated using supply and demand relationships from historical data. This phase resulted in several inferences.

- A stabilization program with payments to feedlots only would be much less costly than one with payments to cow-calf operators only or jointly to cow-calf operators and feedlots.
- Despite its lower cost, the benefits, in terms of both the level and stability of potential target variables for the feedlot and the cow-calf sectors, would be much higher per dollar of program cost for the program targeted only at feedlots.
- None of the programs for either species is found to have material impacts on the U.S.

The second phase was predicated on the fact that the supply and demand equations used in the first phase were estimated using data which were partly generated from a period of time that included federal and provincial stabilization programs. Thus the results of the first phase may have been affected by these programs. Since the effect of the program for hogs is an issue with respect to countervailing duties, this phase attempted to determine the actual supply response to the program. To do this, supply equations were estimated using data from the period after 1975 (when the federal Agricultural Stabilization Act was amended and when the earliest provincial programs came into being), and the response to net provincial and federal payments was tested. The results show that, with the exception of small responses in Manitoba and the Atlantic provinces, no supply response to the program could be identified.

The conclusions above have several implications.

First, there is little in the results that is surprising or new. In fact, logic dictates that the important parameters in determining the effects of a Canadian stabilization program are the elasticities of supply, producers' supply response to risk reduction, the elasticities of price transmission and the price elasticity of demand. In reality, these parameters may be changing and/or, in the case of risk, we do not know what they are. For these reasons, it may be preferable to develop a simple synthetic model of the red meat sector, employing concensus estimates of relevant parameters, and to use it to conduct sensitivity analysis with respect to the key parameters.

On the other hand, as additional time series are generated by an environment that includes stabilization programs, it becomes increasingly important to estimate their impacts empirically, not only because of international trade disputes, but also to measure the performance of public programs and the payoff to public expenditure.

Second, whether empirical or synthetic models are used in policy analysis, one is sometimes tempted to despair at the result of such analysis, because it is not clear that anyone listens. For example, the relative efficiency of a stabilization program targeted only at feedlots has been amply demonstrated several times in the past. Yet the new tripartite program contains a potentially expensive program for the cow-calf sector.

Finally, the experience with the U.S. regarding the countervailing duty on hogs suggests that there may be little point in conducting economic analysis in such disputes. Section 6 of the GATT Subsidies Code states rather clearly that an importing

nation must demonstrate that subsidies in an exporting nation cause material injury to the importer's domestic industry. The U.S. International Trade Commission did not require such evidence of the U.S. petitioners. No *prima facie* case was made. Moreover, the analysis of response to Canadian hog stabilization programs presented here was also presented to both the ITC and the International Trade Administration. The evidence was not refuted; it was simply ignored. Thus in our view, the U.S. government simply ignored the provisions of GATT to which it agreed. So long as the Canadian government allows this to occur, economic analysis in these situations has little value.

Comment

*William H. Meyers**

The authors are to be commended for a careful and well-documented study. Like the paper prepared by Charlebois and Cluff for Agriculture Canada, this provides the information on costs and benefits that policy makers need. Something that can help researchers as well as policy makers is to ask the same question of several different models and see what differences there are in the answers. Such differences are often due to different structural or behavioral aspects of the models. The differences may also be due to different design of the policy experiment or to different periods over which the analysis is conducted. With all of those caveats in mind, I have tried to compare the results of these two analyses.

The Martin and Meilke paper seems to have used some of the same assumptions as those of the Charlebois and Cluff paper. In particular, there is no change in the price expectations mechanisms, the payments to producers are considered the same as the market prices in that mechanism, and there are no risk effects in the model. Authors of both papers arre very aware of the effects of these assumptions. The thing I am not too clear on yet is exactly how the definition of the baseline and how the alternative policies differ between the two analyses. Table 6.16 presents a few numbers of comparison that I derived from the two papers.

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TABLE 6.16 COMPARISON OF TWO ANALYSES OF BEEF STABILIZATION PROGRAMS

	Change	
	Martin and Meilke (1973-82)	Charlebois and Cluff (1980-89)
Production	(percent)	
Beef	1.2	0.5
Pork	0.5	2.4
Price plus payment		
Feeders	1.7	7.5
Steers	NA	1.8
Hogs	NA	4.1
Net exports	(million pounds)	
Beef	19.0	2.6
Pork	8.2	10.0
Price variability (incl. payments)	(coefficient of variation)	
Steer price	−1.9	−0.1
Feeder price	NA	+1.8
Hogs price	NA	−3.4
Average annual government cost	(million Canadian dollars)	
Cattle	17.6	45.6
Calves	30.2	54.0
Hogs	14.4	104.8
Total	62.2	204.4

[a] excludes payments

Some of the comparisons are in percentage terms, because the analyses were conducted over different periods, and not all of the baseline figures are comparable. Martin and Meilke cover the period 1973-82 and Charlebois and Cluff the period 1980-89. There are important differences in these periods which are noted below.

The production effects are either production or marketings. Martin and Meilke have an increase for beef of about 1.2%, compared with 0.5% in the Charlebois and Cluff study. The pork production would have increased by 0.5% in the Martin-Meilke study, compared with 2.4% in the Charlebois-Cluff study. The price effects are comparable only for feeder calves, where both studies

include the payments. The feeder price increase in the Martin-Meilke study is much smaller than that in the Charlebois-Cluff study. The latter study shows smaller price impacts on steers and hogs than on feeders. The former study finds a much larger impact on beef exports. But both studies give similar results for the change in pork exports.

The only basis for comparison of the variability of price plus payments is with steer prices. In this case, the coefficient of variation decline in both analyses, but the decline is much larger in the Martin-Meilke study. The larger impact on price variance could be related to the higher base level of price variability in the 1970s. Price variability for feeder calves actually increase in the Charlebois-Cluff study.

The average cost of the program each year is more than three times as large in the Charlebois-Cluff study, with the biggest difference occurring in the cost associated with the hog sector.

These comparison are admittedly superficial, because they do not attempt to explain the reasons for the differing results of the two studies. They do, however, point up the importance of doing these kinds of studies in a more coordinated framework. The Martin-Meilke model adds an important dimension to the analysis by including an endogenous U.S. livestock sector. Thus, the results of the Canadian program can be traced through to their potential effects on the U.S. market and can suggest whether trade policy reactions in the U.S. are probable. The problem with this study is that it is conducted over a period which is fundamentally different from the current period in terms of economic environment. Thus, if these two studies were presented to a policy maker, they might serve more to confuse than to inform the policy decision. Even if the differences in results are carefully rationalized in terms of differing periods or differing assumptions, it may be difficult to draw general polcicy conclusions from them.

I believe there is a way out of this dilemma. Those of us involved in modeling realize that we do not know the precise levels of behavioral coefficients or do not have the best possible model specifications at our disposal. If there are two or more models available which can be used to evaluate the same policy question, a coordinated evaluation using these models would generally be more informative than any single one. Coordination is extremely important as a way of reducing the differences in inputs that can influence the model output. In particular, the same period of analysis should be used whenever possible, the baseline assumptions should be as close as possible, and the policy question

should be formulated as consistently as possible across the models. This could at least reduce the number of discrepancies in underlying assumptions and hopefully would also reduce the variance of the policy impacts that are generated. Government agencies such as Agriculture Canada, which support research at universities, could increase the returns to those research investments by initiating such coordinated policy evaluations when important policy issues arise.

Comment

*Eileen Krakar**

Rather than discuss the contents of this paper, I will concentrate on discussing the work done at Agriculture Canada as it pertains to the trade implications of stabilization programs. These were discussed briefly in the paper presented by Charlebois and Cluff. The assumptions about how producers react to stabilization payments are the same as those for the results I will discuss, and also much the same as those for the results in the paper presented by Martin and Meilke.

First, our results illustrate that, because of the structure and trade setting of the North American livestock market, any supply response due to stabilization payments will affect the trade balance directly. We estimate that between 85% and 90% of increased production will be reflected either in increased exports or reduced imports, depending on the basis of trade (export or import basis). This estimate is quite similar for both beef and pork.

Second, given the current U.S. countervail action on hogs and pork, it is appropriate to examine the effects of countervail duties on live hogs/pork and live cattle/beef. The average simulation payment over the period 1980-89 was calculated and the model was resimulated; the average payments worked out to $1.74/cwt for fed cattle, $4.39/cwt for hogs, and $4.00/cwt for feeder calves. Tariffs were then applied to these amounts on live trade and their equivalents in dressed trade.

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The results of this exercise are that both the tariffs and the level of trade for hogs would have been lower, compared with the (noncountervailed) stabilization scenario and with the baseline scenario (which had current ASA provisions). However, in the case of cattle, the presence of new stabilization programs and countervail duties would still provide enhanced domestic production and trade. This result stems from the higher duty on feeder cattle and from the fact that fed cattle exports (excluding cows and bulls) are minimal. Perhaps most significant is that the application of countervail duties would cause the estimated total program cost to rise by almost 11% during the period.

There is a further notion that remains to be assessed, namely, the effect of countervail and stabilization on both effective producer prices and production. The duties applied in our results were constant over the period; in actual practice they would likely be related to stabilization payments made in the previous year. This practice could serve to destabilize rather than stabilize the livestock industry, compared with the no-program case.

A final comment concerns perhaps the most critical aspect of all our results. Martin and Meilke report the work of Martin and Goddard (1985) concerning the testing of producer response to stabilization payments. In Canada, the presence and awareness of stabilization programs is growing, and producer experience with stabilization programs is increasing. As more observations become available, there should be more conclusive tests on the response of producers to stabilization programs. This is one link in the analysis that is missing; obviously, if programs do not affect production levels, no trade effects will result. Furthermore, work in this area could suggest ways in which programs might be designed to reduce output response and therefore adverse trade consequences.

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7

Domestic Market Linkages and Sector Stabilization Policy

*John B. Penson jr. and Robert F. J. Romain**

The farm sectors in both the U.S. and Canadian economies are more highly integrated in their respective economies today than they were at the end of World War II. No longer largely self-sufficient, farmers in both countries rely heavily on the supply of physical and financial capital to carry out their production operations. Therefore, national economic policies that affect farmers directly, such as a lower tax rate, also affect them indirectly through the effects these policies have upon input suppliers, processors, manufacturers, financial intermediaries, consumers and foreign trade.

The purpose of this paper is to illustrate how the stability of the financial structure and performance of the farm sector can be affected by macroeconomic policy. As an aside, this paper illustrates the importance to U.S. farmers of efforts to control the U.S. budget deficit. The first section of this paper discusses the relationship between the farm sector and the general economy in broad terms. The second section highlights the growing sensitivity of the farm sector to macroeconomic events. The U.S. experience is used to make the point that the farm sector in industrialized economies is more sensitive than ever before to changes taking place outside the sector. The third section presents several broad macroeconomic policy options for the U.S. economy and their effects

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Funding for this research was provided by the Texas Agricultural Experiment Station and the U.S. Department of Agriculture. All programs and information of the Texas Agricultural Experiment Station are available without regard to race, ethnic origin, religion, sex and age.

on the financial structure and performance of the U.S. farm sector. The final section draws several implications for the design of an effective stabilization policy.

Agriculture and the macroeconomy

Two sectors of the economy are said to be interdependent if they rely directly on each other – or indirectly through a third sector – for the supply of a particular good or service used in their production process. Thus, if the farm sector both supplies inputs to and purchases products from another sector, these sectors are by definition interdependent. The interdependencies between agriculture and the rest of a nation's economy essentially can be grouped into two groups: those dependencies that others have upon the farm sector, and those dependencies which the farm sector has upon others.

Perhaps the most obvious example of a dependency that others have upon the farm sector in an economy is the dependency of a growing population upon food and fiber products. For example, the food manufacturing and distribution sectors in the domestic economy are dependent upon the supply of raw farm products as an input to their business operations. Agricultural lenders as well as nonfinancial firms that supply inputs to farmers are also dependent upon a growing and prosperous agriculture. And the farm sector plays an important role in the balance of trade by partially offsetting the trade deficit in nonfarm products.

Agriculture in turn is dependent on others. Whereas the farm sector in most economies has historically been rather self-sufficient, producing many of its input needs and financing much of its growth with internal equity capital, farmers in many industrialized economies over the postwar period have become much more dependent on the manufactured production inputs supplied by other sectors. A prime example is energy. Not only does the farm sector need energy products to operate farm machinery and motor vehicles, but also it needs fertilizer and chemicals, which are also highly dependent upon energy for their production.

The dependence of the farm sector on the goods and services supplied by other sectors is not limited to physical goods. For example, the fraction of farm capital accumulation financed with external capital has increased dramatically over the postwar period. Off-farm employment has also become an increasingly important source of funds in financing the portfolios of specific groups of farm families. Thus, the growing dependency the farm sector has upon the health of the domestic economy shows up in

financial and nonfarm labor markets as well as in manufactured production input markets. Finally, the farm sector is dependent upon a viable domestic and export demand for its products as well as on the government sector in periods of physical and economic emergencies.

As a result of these dependencies on other sectors, the farm sector is increasingly subject to the events taking place outside the sector. For example, a decrease in export demand for farm products, for whatever reason, lowers both the price of these products and domestic gross income. And higher interest rates in the face of variable rate mortgages translate into higher production expenses and lower net farm income. The uncertainties associated with these financial and nonfinancial market linkages expose farmers to greater market and financial risk.

With these generalizations in mind, we would like to focus on the channel through which events elsewhere in the economy are transmitted to the farm sector.

Nature of transmission mechanisms

There is a wide variety of mechanisms through which events elsewhere in the economy are transmitted to farmers. These mechanisms can be identified by considering the opposite side of the markets in which the farm sector participates, that is, those supply-related factors which affect markets where farmers buy goods or services and those demand-related factors which affect markets where farmers sell goods and services. For example, the relative prices for other goods and services and the level of real disposable income have an effect on the prices farmers receive for their products in raw farm product markets. The prices farmers must pay for goods and services in farm production inputs markets are influenced by the prices manufacturers must pay for their own inputs. In the case of durable farm inputs such as tractors, an increase in the purchase price of the input is just one of many factors influencing the implicit rental price to farmers. Some of the other factors influencing this natural rate include the farmer's effective ordinary income and capital gains income tax rates and their cost of debt and equity capital.

The wage rates farmers pay for hired labor services in farm labor markets are affected by such factors as wage rates paid to comparably skilled workers in other sectors of the economy. The health of the general economy also has an effect on the availability of off-farm employment and the wages earned off the farm by farm families.

Finally, several mechanisms transmit the effects that events outside the farm sector have upon the interest rates farmers pay on loans and earn on financial assets. For example, the yields on securities offered by financial intermediaries and nonfinancial businesses are affected by the demand for loanable funds, and the relative risk and returns on alternative uses of funds available to specific private financial intermediaries will affect the interest rate farmers must pay for loan funds.

This list of transmission mechanisms identifies many but not all of the influences emanating from outside the farm sector that affect the prices and quantities in markets which farmers participate. In general, any event occurring elsewhere in the domestic and international economies which has an impact either on the supply of production inputs, financial assets, and loan funds to farmers or on the demand for raw farm products represents a transmission mechanism through which events, regardless of their origin, are made known to farmers.

Growing sensitivity to macroeconomic events

The farm sector of most industrialized economies has become highly capital intensive over the postwar period. A review of a few key statistics for the U.S. economy will help illustrate this point. The number of farms in existence today is less than one-half the 5.6 million farms that were in existence in 1950. The average size of farm in the U.S. over the postwar period has slightly more than doubled. This statistic masks the tremendous growth of the United States' largest farms. The 50 000 largest farms in this country accounted for 36% of total farm product sales in the early 1980s, as opposed to only 23% in the early 1960s. There has also been a substantial expansion of the use of manufactured resources in the U.S. sector. Capital's share of production expenses has doubled since 1950, while labor's share has fallen by one-half. Today there is almost twice as much capital invested in buildings and equipment per worker in the U.S. farm sector as there is in all nonfarm businesses taken together. Finally, the proportion of farm capital accumulation financed with debt capital in the United States has risen dramatically as well.

In addition to these domestic trends, U.S. farmers have increasingly produced for world markets. The quantity of U.S. farm products shipped abroad has tripled since 1950. Approximately 40% of total U.S. production of grain and oilseed crops today is exported to other countries.

These trends suggest that U.S. farmers today are much more affected by events taking place elsewhere in the economy than they were at the end of World War II. This in turn suggests the need for an increased awareness of events taking place in the domestic and world economies as well as a greater understanding of the effects that specific macroeconomic policy options would have upon agriculture.

Seeds of current U.S. financial stress

While U.S. net farm income and farm asset values have dropped dramatically since 1980, the seeds of the current financial stress being faced by highly leveraged U.S. farmers today were planted in the 1970s. The first seed to be sown was the high levels of borrowing which took place in the mid-1970s. Interest rates had declined to 7% to 8% since the early 1970s. Inflation was increasing, thereby making the real cost of capital even lower. And most farmers were coming off several good income years in a row. In undertaking substantial debt obligations to expand the size of their operations (often under variable rate terms), farmers were no doubt expecting these high real net returns, low real interest rates and significant real capital gains to continue into the future. None likely expected the sharp upturn in interest rates in since 1979, which saw the prime interest rate rise to over 21%, and what was to follow.

The second seed sown during the 1970s occurred in late 1979 when the Federal Reserve System announced a change in its operating policies. Hindsight suggests this represented a clear sign of a new offensive to fight inflation. This change, coupled with the conflict inherent in the Reagan administration's fiscal policies introduced in the early 1980s (simultaneous attempts to reduce taxes, to increase defence expenditures and to balance the budget), led to the historically high real interest rates observed during the 1980s.

Dimensions of current U.S. problem

The current financial health of the U.S. farm sector can therefore be characterized as poor. Incomes have been low for 5 consecutive years, asset values are declining and debts are overdue. Recent surveys show two to three times the normal proportion of farmers are leaving the sector, either voluntarily or through forced sales (see Federal Reserve Bank of Kansas City, 1984; Federal Reserve Bank of Chicago, 1984). Farm loan losses at banks and the Farm

Credit System has grown dramatically (Melichar, 1984; Irwin, 1984). Delinquencies at the Farmers Home Administration now exceed 30%. A recent USDA report suggests that 6.3% of all of the commercial farms in this country are technically insolvent. Another 7.4% are moving rapidly toward insolvency. An additional 20% are in serious financial conditions but will be able to survive a few more unfavorable years.

The deterioration of farm financial conditions also has serious spinoff effects for agricultural lenders and rural communities. Commercial banks have experienced sharp increases in delinquencies and loan losses over the past few years. Twenty-three agricultural banks failed in 1984. The Farm Credit System is having severe problems of its own. Ten production credit associations were liquidated in 1984 and more liquidations and consolidations are being discussed. Finally, many rural communities closely tied to agriculture are experiencing economic problems as well. For example, Mount Ayr, Iowa, a town of 1900 people, has lost three farm implement dealers, its major department store, one of its two banks and its grain elevator.

Effects of alternative macroeconomic policies

The previous discussion suggests that macroeconomic policy has had a large hand in creating the financial stress many U.S. farmers are currently experiencing. Confronted with high budget deficits, the Reagan administration has shown little support for the expenditure of funds to stabilize farm prices at what many feel are politically acceptable levels. Specific combinations of monetary and fiscal policy, however, may help restore financial health to the U.S. farm sector. To test this hypothesis and to illustrate the impact of macroeconomic policy on the future financial stability of the U.S. farm sector, let us examine three broad combinations of macroeconomic policies for the U.S. economy to the year 1990.

Three projections of the future financial conditions of farmers are made in this paper. These projections are made using COMGEM, a commodity-specific general equilibrium model of the U.S. economy developed at Texas A & M University, which places particular emphasis on agriculture. COMGEM has been used in the past in policy analysis as well as in current situation and outlook work at the U.S. Department of Agriculture (for an overview, see Penson, Hughes and Romain, 1984; for additional details on the scenarios developed in this paper, see Hughes, Dean and Penson, 1985).

Three caveats must be mentioned before our projections are presented. First, because of the uncertainties attached to political

and other noneconomic factors, the projections presented in this paper should be thought of as what could happen to farm sector financial conditions if specific macroeconomic policies were pursued. They should not necessarily be construed as forecasts of what the future will bring. It is likely, for example, that policies as stressful to the farm sector as the first two scenarios developed in this paper would lead to government policies that are impossible to predict at this time. Second, each scenario is instituted in 1984 and terminates in 1990. January 1, 1984, represents the latest date for which published information on the financial position of the farm sector is available. Thus, while we do have information on the performance of the general economy in 1984, our scenarios try to determine what effect specific combinations of monetary and fiscal policy would have on the profitability and financial condition of farmers over the 1984-90 period from the viewpoint of January 21, 1984. Third, no attempt is made to outguess farm policy makers in these scenarios. Farm policies are identical across all three scenarios; each reflects a continuation of the 1981 Farm Bill at 1984 levels of support. No surprises in either energy prices or weather are assumed in these scenarios, although both will likely have an effect on the sector over the remainder of this decade.

High deficits and slow money growth

The first scenario examined assumes adherence to expansionary fiscal policies and restrictive monetary policies. Such policies would be reflected in continued high government deficits and a slow growth in the money supply to fight inflation. While inflation has currently fallen to the 4% to 5% range, this was almost as high as the rates that caused the Nixon administration to implement price and wage controls in the early 1970s. Therefore, it is not out of the realm of possibility that the Federal Reserve will continue to slow the growth of money. The annual government budget deficit is assumed to remain at its 1984 level in real terms through 1990. Monetary policy here is designed to achieve the Federal Reserve's goal of eliminating inflation; while attempts to further reduce inflation would probably introduce more volatility in the economy than is shown in these projections, the implications of another period of disinflation for agriculture in the face of large government deficits are clearly indicated by COMGEM's projections. The effects of these broad policy objectives on the economy in general and the farm sector in particular are as follows.

Within the general economy, attempts to reduce inflation below existing levels in the face of continued fiscal stimulus would lead to

a period of high real interest rates and slow growth throughout the economy. Growth in real GNP would average about 2% annually from 1985 to 1990, substantially below the economy's long-run potential growth rate, which is normally assumed to be about 3%. The real prime interest rate would continue to grow throughout the period, reflecting the continuing conflict between fiscal and monetary policy.

As for the farm sector, the effects of continued slow growth in incomes and even higher real interest rates on the farm sector would be lower net farm incomes and declining farm asset values. Figures 7.1 and 7.2 graphically illustrate these trends. The solid lines represent the results associated with this scenario. Net farm income expressed in 1967 dollars would fluctuate between $5 and $12 billion to 1990 with no apparent trend. Its average over the 1981-90 period would be $9 billion, compared with the $15 billion average observed during the 1971-80 period.

FIGURE 7.1 PROJECTED REAL NET INCOME

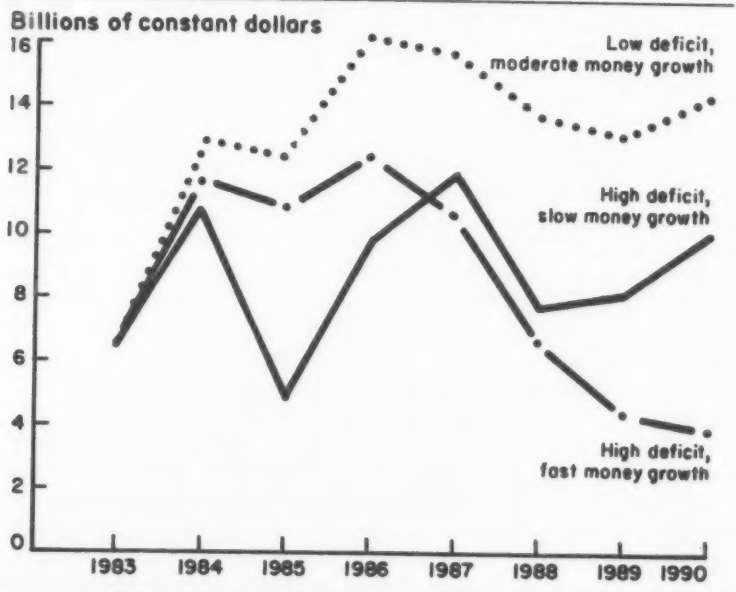
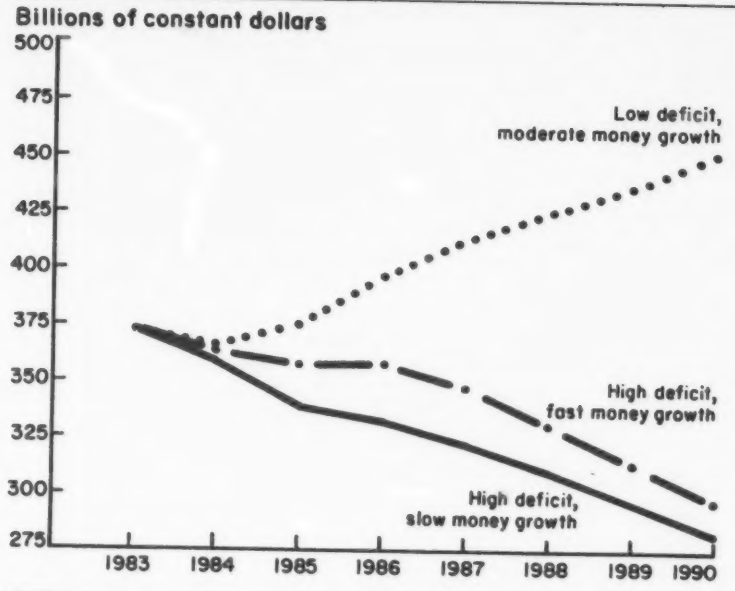


FIGURE 7.2 PROJECTED REAL ASSET VALUES



Farm asset values would also decline substantially under this scenario. By 1990, they are projected to be approximately three-fourths of their 1983 value in constant dollar terms. Most of this decline would be registered by physical assets, with the principal loss coming in farm real estate values. The net result of declining asset values and a moderate increase in debt would be a substantial decline in sector wealth and increasing leverage ratios. The debt-to-asset ratio for the sector is projected to grow from 21% in 1983 to 32% in 1990. Certainly the sector would have far fewer farmers without debt if these projections are realized. In addition, farmers who had low debt-to-asset ratios in 1983 would likely be more highly leveraged by 1990. Those farmers who currently have moderate to high leverage ratios would likely be forced out of business.

To summarize, prospects for the farm sector are dim if the deficit remains high for the next 6 years and if the burden of fighting inflation falls squarely on monetary policy. Farm incomes would likely remain low and asset values would continue to decline.

Under these conditions, the farm sector would probably end the decade in very weak financial health, unable to show much resilience to change and perhaps less productive than it is currently.

High deficits and fast money growth

The second scenario assumes the Federal Reserve changes direction and allows the money supply to grow at a faster rate while high deficits continue. Past history reveals that periods of low growth and low inflation are often followed by periods of rapid growth and higher inflation. Specifically, annual government budget deficits are held at their 1984 level in real terms through 1990, as they were in the first scenario. A more expansionary monetary policy stance by the Federal Reserve is assumed, which allows inflation to grow at 1% per year; the annual inflation rate would reach double-digit levels by 1988. The effects of these policies on the economy in general and the farm sector in particular are as follows.

Within the general economy, the impact of the broad combination of policies would be largely reflected in real interest rates. The surprise of monetary authorities reversing their current policies would allow both the nominal and real rates to decline in the short run. As this new policy stance became generally accepted and built into expectations, however, real rates would grow to clear financial markets still servicing huge government borrowing demands. Nominal rates would grow even faster, reflecting the higher rates of inflation. Growth in real GNP would be higher than the annual rates of growth in the first scenario.

As for the farm sector, a faster growth in the money supply would help the farm sector in the short run, but would be harmful to the sector over the long haul. Real net farm income is projected to be higher than that under the first scenario through 1986. This is principally due to higher foreign demand for farm products. The early reduction in U.S. real interest rates under this scenario would reduce the value of the dollar versus other currencies. By the end of the decade, however, growth in real interest rates would increase the value of the dollar, decrease export demand and add to farmers' interest expenses. Moreover, the higher rate of inflation in this scenario would lead to higher farm production expenses. Long-run constraints on growth in demand and rapid increases in production expenses would result in projections of real net farm incomes in the late 1980s substantially below levels anticipated under the first scenario.

The decline in real farm asset values associated with a faster growth in the money supply would be lower than that in the first few years of the first scenario. The decline in real farm asset values would become greater in later years, however, due to declining farm profitability. The debt-to-asset ratio for the farm sector would increase from the 21% recorded in 1983 to 33% in 1990. Thus, many of the same adjustments expected under the first scenario would take place even under a less restrictive monetary policy. Monetizing the deficit, therefore, is not the solution to the problems faced by highly leveraged farmers. It suggests that farmers would experience lower incomes, slightly higher real asset values and more debt by the end of the decade than they would under the first scenario.

Lower deficits and moderate money growth

The third and final scenario assumes an adherence to a more restrictive fiscal policy and a moderate monetary policy. These policies would lead to lower budget deficits and a money supply that falls between the levels given in the first two scenarios. For example, the annual federal budget deficit in this last scenario is assumed to be declining by about 15% per year in real terms through 1990. While this scenario represents an admittedly optimistic view of the future, it is one which has some chance of occurring. The effects of this policy combination on the general economy and the farm sector are as follows.

Within the general economy, the projected growth in real GNP under this scenario would lie between the projected real GNP growth under the first two scenarios. It would be higher than that under the first scenario because monetary policy would be less restrictive. And it would be lower than that under the second scenario because monetary policy would be more restrictive and fiscal policy would be less stimulative.

The sharply lower real interest rates to 1990 under this scenario underscore the significant reductions that could be gained if monetary and fiscal policies were to work together toward a common goal. The net result would be declining real interest rates throughout the decade. Moreover, declines in inflation would help hold nominal interest rates down.

As for the farm sector, this scenario would lead to higher farm incomes, rising farm assets values, and moderate growth in the use of debt financing by farmers. Real net farm incomes would rise rapidly and then fluctuate at higher levels than under the first two scenarios. While these projected real income levels would not reach

the $26 billion level observed in 1973, they would substantially exceed the levels achieved in the early 1980s. The reasons for this improvement can be attributed to the favorable trends in interest and inflation rates. Lower interest rates would decrease the value of the dollar and expand export demand. At the same time, lower rates of inflation would keep production expenses from growing rapidly. The net result would be a higher level of profitability for the farm sector.

When higher farm profitability is combined with lower interest rates, it is not surprising to see farm asset values start to increase. The average annual growth rate for real farm asset values over the 1985-90 period under this scenario would be 4%. This is less than the 6% actual real growth rate experienced during the 1970s, however. Most of the gain in the value of farm assets under this final scenario would be associated with farm real estate, although machinery and equipment would also show steady gains. Finally, the debt-to-asset ratio would decline from the 21% observed in 1983 to 20% projected by 1990. Under the macroeconomic policies assumed under this final scenario, adjustments currently under way in the sector would likely slow down or be reversed. Instead of going out of business, highly leveraged farmers and ranchers would likely do relatively well. Farmers who prefer to be without debt could probably avoid borrowing. And farmers with moderate debt-to-asset ratios would not be forced into more highly leveraged situations.

In summary, reductions in government deficits and a moderate increase in the money supply could leave the farm sector in an improved financial condition by the end of the decade. Steady economic growth, lower inflation and lower interest rates would result in higher net farm incomes and farm asset values and in a moderate growth in farm debt. This suggests that the sector would be more resilient to weather and other shocks.

Implications for stabilization policy

Large government deficits and a monetary policy that has reduced the inflation rate by more than one-half during the 1980-84 period have had a dramatic negative impact on highly leveraged farmers. Improvement in their financial position in the future will depend to a large degree upon choices made about future blends of monetary and fiscal policies. Three sets of assumptions about future macroeconomic policies are used in this study to examine the range of possible outcomes for the farm sector through the end of the decade. The two scenarios which assume the existence of large

deficits show a farm sector with substantial financial problems by the end of the decade. Both scenarios suggest high real interest rates, low farm incomes, declining farm asset values and further growth in leverage. Neither of these two scenarios indicate significant declines in the production of food and fiber, but substantial dislocations in ownership patterns are likely to occur. The third scenario, however, suggests that a reduction in budget deficits and a moderate monetary policy would generate higher farm incomes, higher asset values and a moderate growth in farm debt. Such outcomes are likely to leave the sector more productive and more capable of dealing with external shocks.

Within the context of stabilization policy, the sector is seen to be highly sensitive to multi-market forces brought about by alternative combinations of macroeconomic policy. This paper argues that instability in macroeconomic policy is transmitted not only through fluctuations in product prices, but also through fluctuations in input prices, interest rates and farm asset values. This combination of effects can have a substantial impact on the profitability and financial position of farmers.

If the goal of stabilization policy is to stabilize the structure and performance of the sector, programs to implement this policy must necessarily focus on returns to equity capital, labor and management. If this program were instead based upon stabilizing returns to total (i.e., both debt and equity) capital, labor and management, one of the greatest sources of instability facing U.S. farmers in recent years (i.e., interest payments) would be ignored.

This brings us to the rationale underlying the red meat stabilization proposal advanced in 1984 (Agriculture Canada, 1984). Proposals such as this can be justified on the grounds that they not only would stabilize net returns to beef producers but also would help stabilize farm asset values, deposits and loan demand at financial intermediaries, and the economic condition of rural communities. Stabilization programs offer protection from unwanted downside shocks to net returns and would soften or slow down any downsizing of the sector that may be taking place. This same feature can also provide the basis for criticisms of stabilization programs in general; namely, protection from low net returns would help inefficient producers stay in business and would encourage overcapacity. Farmers, while approving of a floor being placed under their net returns, typically strongly disapprove of any ceiling being placed on their potential profitability. It is also somewhat unclear whether the rationale for the red meat stabilization proposal is based entirely on economic grounds, or

whether other issues such as distortions to comparative advantage inherent in existing provincial policies are being addressed as well.

Finally, we must ask who are the clientele for this proposal, or who are being protected from downside fluctuations in their equity. Because the proposal currently calls for stabilization of returns of total capital rather than equity capital, borrowers adopting the latest technologies or expanding the size of their operations are more at risk than nonborrowers. Because national as opposed to regional average costs of production are used in determining the size of the support payment paid to the producer, the more efficient production regions are less at risk than the higher-cost production regions. These considerations raise question as to who will survive if this proposal is adopted and who will not survive. Further analysis, perhaps using a whole farm stochastic simulation model which examines the long-term survivability of different sizes of farms under different financial leverage positions in different regions of the country, should be pursued to shed further light on the distributional benefits of this proposal.

Comment

*Jon Brandt**

I believe this paper suggests four important effects on U.S. agriculture. Probably these kinds of effects are similar for the Canadian agriculture. First is, of course, the dependency of agriculture on other sectors in the national economies. These dependencies have grown substantially in the past couple of decades.

Second is the dependency of agriculture on the world economy. Clearly this is evident from the world recession that has been in effect since the early 1980s, and the slow sluggish recovery from that recession has affected the international export market. The world market grew in the 1970s and the U.S. share of that market grew. Since the early 1980s, that market has not grown; in fact, it has probably declined some, and the U.S. contribution to that market has declined as well. So these impacts on the world

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economy are very important to the agricultural sectors of the U.S. and Canada, which do a lot of exporting.

Third, the paper peripherally alludes to the impact of the value of the dollar. Since the paper is written largely with respect to the U.S. agricultural sector and so the U.S. value of the dollar has affected its ability to retain that market trade share.

The fourth effect, which is also related to the first three, is the fact that the budget deficit and the interest rates related to it in the United States have had a crowding out effect on the ability to borrow. Certainly the growth and the capital intensive nature of the U.S. agricultural market sector has made it more dependent upon changing interest rates in the last 10 to 15 years. The paper notes this rapid increase in the level and the rate of borrowing in the late 1970s. High real interest rates have made it more difficult to borrow, which has driven many farmers to insolvency, as the paper points out. There are financial figures available that are even more recent than those quoted by Penson and Romain, which suggest that the problem in 1985 is even more acute than it had been in 1984 and 1983.

I would add to this a fifth point, which I believe has been a factor contributing to the farm income problem, particularly in the United States. It is the inconsistent message or direction that has been provided by U.S. agriculture policy. As agricultural economists, I think we have to bear some of this responsibility as well. For example, the 1981 Farm Bill was based on a period of optimistic growth which projected rising values of farm products and of real estate. Then we had the 1983 Payment-In-Kind Program, which suggested we cut back production severely. Now we have a 1985 administration farm proposal that suggests we drop supports, a proposal which is not likely to be adopted. But the suggestion here is that the U.S. farm producer is getting inconsistent messsages, even from those who make policy. I think this has created or contributed to, rather than reduced, the uncertainty that the producers have been facing in recent years.

Of these five factors, the 1985 Farm Bill probably has the least potential of improving the U.S. farm sector environment and of helping it recover from its current dilemma. I think I would support the Penson-Romain paper strongly in this respect. Work at the University of Missouri supports their hypothesis that macro effects (interest rates, deficit, GNP, etc.) are far more important to the agriculture sector than any minor changes in the Farm Bill currently being considered.

Prof Penson suggested to me in conversation that all the current rhetoric about these alternative Farm Bill proposals is somewhat analogous to rearranging the chairs on the Titanic. I think that is somewhat appropriate, because the minor changes we are talking about in farm policy do nothing with respect to what the more important impacts of macroeconomic linkages and world linkages are likely to have. So if one allows these points, then perhaps one should question the purpose of discussing farm stabilization policy if it is completely overwhelmed by macroeconomic and other uncontrollable effects. Given that question, the paper goes on to discuss the three scenarios from their model.

A change I would like to have seen Penson and Romain make, which relates to their caveats, is to begin their analysis in 1985. Even though published data are not available, there are quite a lot of data available from state surveys, which suggests that we have a very good handle on financial farm information that is more current than January 1, 1984, data. Maybe those data or that information would suggest even more drastic implications, if they were to base the study upon 1985 data rather than upon the data available at the time, although I am not sure what kinds of data are specifically required to drive the model.

Second, the results are very illustrative of the macroeconomic impacts on the agriculture sector. Unfortunately, the model is not capable of disaggregating these effects by enterprise or by commodity. In other words, how do wheat producers fare relative to corn growers? Also, it would be interesting to know what these distributional impacts would be in terms of larger farm operations versus the smaller operations. These are the things that Prof Penson has suggested need to be looked at in a more disaggregated form.

Third, Penson and Romain's third scenario illustrates the positive impact of a reduced federal deficit and of lower real interest rates. Note that farm policy in all three of their scenarios was essentially held constant, based on a continuation of 1981 Farm Bill, but that far different results would be generated, based upon macroeconomic assumptions. So, the macroeconomic effects would likely be far more important to the welfare of the agriculture sector than any farm policy proposal for the next 4 years. Unfortunately, as Penson and Romain offer, the third scenario is probably far too optimistic a view of what the future is likely to be in the United States and, I suspect, in Canada.

At the University of Missouri, we have taken a slightly different approach from that taken in this paper. We have examined

alternative farm policy designs but have kept the macroeconomic and international assumptions somewhat constant. Specifically, we have looked at a modified extension of the current Farm Bill, we have looked at an improved export scenario for the U.S. trade sector and we have looked at a version of the administration's proposal. So whereas the Penson-Romain paper looks at constant farm policy and alternative macroeconomic assumptions, we have looked at constant macroeconomic assumptions and alternative farm policies. Our results essentially support those of the Penson-Romain paper. None of the prescribed farm policies that we looked at would bail out the American agriculture sector from its current financial dilemma in the foreseeable future to 1990-91.

Returning to the question of our ability to stabilize, we grappled with this a bit at the University of Missouri recently. The question was not clear to me at the time because I had not participated in some of the discussions going on here. Were we trying to stabilize prices, profits to the producer, income or production? I think it is a difficult question to deal with, as we have found out here, particularly when looking at only one or two markets, namely, beef and pork, relative to all of the other markets, and particularly when the macroeconomic effects are unstable, as they have been in the past 5 to 10 years. In the U.S., we have not faced this stabilization issue on the livestock or meat side of the sector, as we are all trying to discuss here. But U.S. farm policy efforts on the crops side to date have been less than sterling. They are not likely to improve, since macroeconomic effects wuold overwhelm any farm policy design currently being considered, even if these farm policies designs could be based upon accurate forecasts of future price, production and utilization levels.

In conclusion, I support Prof Penson's idea that, unfortunately, our ability to stabilize is more highly influenced by factors outside the control of the agriculture community, such as growth in the economy, interest rates, deficits, and the world economic environment, than we would really like to admit. So we may come away from here feeling somewhat frustrated. We are trying to get at some of the nitty-gritty issues of stabilizing fed cattle or feeder cattle relative to cow-calf operations. But we must obviously look also at how the beef market is affected by other influences such as fluctuations in crops, trade and in particular in macroeconomic variables. The frustration results from one extreme of trying to stabilize income fluctuations at one end of a production process versus understanding or stabilizing the sources of instability that impact on the sector.

Comment

*John Kitchen**

The paper by Profs Penson and Romain is a good analysis and is of particular importance for this forum, given the high degree of integration of the U.S. and Canadian economies. The paper points out how agriculture in the past decade has become increasingly sensitive to macroeconomic policies and to the vagaries of international integration and adjustment. Further, this new analysis presents the empirical results that represent the conclusion to a previous paper by Romain (1985).

The high degree of integration between the U.S. and Canadian economies has been examined recently in various studies. Cumby and Mishkin (1984) observe a close relationship between adjustments in the U.S. and Canadian real rates of interest. Husted and Kitchen (1985) examine interest rates, spot and forward exchange rates, and interest parity condition responses to monetary shocks. Bordo and Choudhri (1982) explain many of the details of the close integration by providing an interpretation that much of the policy adjustment by the Bank of Canada is performed so as to align U.S. and Canadian real rates of interest to smooth or eliminate pressures for currency value realignments in foreign exchange markets. Thus, the importance of U.S. macroeconomic policies becomes more evident for our purposes today.

The terms of reference for this workshop state, "Income stabilization programs have become a major policy instrument for influencing the viability of the farm sector. Recently the federal and provincial governments have been negotiating a new program for red meat commodities and these negotiations reflect experiences with previous programs." The motivation for the negotiations or the program is not clear. Also, as we are here to examine the use of support prices in implementing such a stabilization program, the importance of a macroeconomic analysis may not be so immediately obvious. I am going to argue that the macroeconomic policy impact is the more important one here, and that the concern for a stabilization policy pales by comparison. That is, and I stress, if the U.S. and Canada were to change courses and pursue balanced

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macroeconomic policies, the need for commodity specific stabilization policies would all but disappear. Further, is it desirable to implement expenditure-increasing programs at a time when federal budget deficits are large and increasing?

Much of what I am going to say here about real rates of interest is also tied in with exchange rates (because of highly integrated international financial markets and capital mobility) and with deteriorating financial conditions, in a balance sheet sense. However, I will leave these effects in the background and concentrate on some specific real interest rate impacts, but we should realize that the other factors exacerbate the problems.

To put this view in perspective, recall the Jarvis (1974) analysis of the standard producer's investment decision for the case of biological production functions. Jarvis's view is that the decision to maintain the breeding animal as a capital good rather than converting it to a consumer good through slaughter depends primarily on the real rate of interest and the market price for the slaughtered animal. In a period of prolonged relatively high real rates of interest, when producers are faced with expectations of lower future market prices, the correct economic decision is to liquidate some of their breeding inventory. That decision will lead to reduced supplies in future periods, which is a market solution for eliminating downward pressure on prices. The active pursuit of support policies would not provide the same results. Rather, the effective price signal would be distorted and incentives disrupted.

In a situation of low real interest rates, however, the opportunity cost of keeping a breeding animal rather than liquidating it is greatly reduced *ceteris paribus*.

The real interest rate impact is not limited to the producer's inventory decision. As Frankel (1985) demonstrates in his reformulation of the overshooting model of exchange rate determination to apply to domestic commodity price determination, commodity markets are overly sensitive to macroeconomic factors, particularly the real interest rate. The overshooting occurs when commodity prices fall by more in the short run than the amount required for long-run equilibrium. This overshooting occurs because commodity prices are flexible and are determined primarily in auction markets, while other prices in the economy are "sticky," being determined in contract markets. The commodity arbitrage condition leads to drastic reductions in real commodity prices as real interest rates increase.

As the Penson-Romain study clearly shows, if the Canadian and U.S. governments wish to alleviate the negative pressures on

agricultural producers, the answer currently lies in adopting balanced macroeconomic policies which will aid in reducing the fiscal and monetary pressures that lead to high real interest rates and high currency exchange values. The recent evidence on commodity specific stabilization policies does not provide much support for their continued extensive use, particularly in an era of high fiscal deficits. There is mounting evidence, of which the Penson-Romain study and those like it are important parts, that agricultural stability will best be promoted by stable and balanced macroeconomic policies. Perhaps our current and future efforts should focus more on informing our legislators and their constituents of the importance of balanced macroeconomic policies.

Comment

*Ralph Ashmead**

My review of this paper concentrates mainly on the impact of the different macroeconomic scenarios on the Canadian agricultural scene.

The scenarios presented in the paper particularly discuss the impact of expansionary fiscal policies combined with the restrictive monetary policy and the impact of expansionary fiscal policy combined with an expansionary monetary policy. Both scenarios lead to some general conclusions with which I agree. For example, both these scenarios would show a higher level of interest rates and a lower rate of farm incomes, resulting in an increase in the level of financial stress on the agricultural community. They would result in an increased use of leverage, declining asset values and a higher U.S. dollar. This is the U.S. impact.

If we look at this from a Canadian point of view, we may find an opposite point of view. For example, the result in Canada might not be as negative as the impact in the U.S. Why can we say that? As interest rates increased in the U.S., this would add to and support a higher level of the U.S. dollar. The U.S. dollar being high, while bad for U.S. farmers, could potentially be positive for Canadian farmers. This conclusion is a function of the fact that a high U.S.

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dollar would make U.S. farmers less competitive in their export markets. This means that, to the extent Canadian farmers produce the same type of products for the same international markets, they would have a greater capacity to penetrate these markets.

The third scenario presented by Penson and Romain is with respect to a restrictive fiscal policy and a moderate monetary policy. The impact of this scenario in the future would be for declining real interest rates, which would likely result in higher profitability for the U.S. farm sector and in increased farm asset values. In summary, it would be good for U.S. agriculture. The impact on Canada may potentially be the opposite. With their increased competitive ability, U.S. farmers would capture a larger share of the European and other export markets at the expense of Canadian exports.

The U.S. government has essentially followed a conflicting fiscal and monetary policy over the last 5 years, as pointed out in the paper. The result of this conflicting policy has resulted in the high level of the U.S. dollar, a high level of real interest rates and a decline in inflation and land values in both countries. On balance, it could be suggested that this conflicting fiscal and monetary policy has been positive for Canadian farmers. As noted above, the high-valued U.S. dollar has allowed Canada to export more. Further, the fairly low value of the Canadian dollar relative to the U.S. dollar has allowed Canada to enjoy a high level of exports to the U.S.

One major observation made in the paper which cannot be over emphasized is the fact that we will continue to be in an environment of volatile interest rates. This would create additional instability to the agriculture sector and would impact very much on the agriculture sectors in both countries. This leads to discussions as to how this volatility in the financial markets would impact on agriculture, and how it could be controlled, modified or perhaps even used to advantage in the reduction of risk to farm businesses. Considerable concern is expressed now in Canada for the state of the agriculture economy. Although we may view the future with some pessimism now, it is suggested that the Canadian agricultural economy even now is living in almost a false economy. The point being made is that we have enjoyed a very low-valued Canadian dollar relative to the U.S. dollar and we have enjoyed the impact of a high U.S. dollar relative to its trading partners, which has allowed us a relatively favorable position in terms of export markets.

To the extent that the U.S. dollar may decline over the coming years and/or the Canadian dollar may increase in value relative to the U.S. dollar, there are very serious implications for Canadian agriculture. For example, if the U.S. does achieve the ability to control its deficit, the impact would likely be that its dollar would fall and that it would achieve greater export markets. This would place pressure on Canadian exports. A falling U.S. dollar is negative to Canadian agriculture.

The point was made that interest variability has negative implications for agriculture in that, as farmers have to make more and more short-term interest loans, the risk to farming enterprises is increased. This general statement has to be questioned. The point has to be made that interest variability contributes to farm risk only when that variability is negatively correlated to the variability of farm incomes. To the extent that variability in financial markets is positively correlated to farmers' net income, the variability in the financial market can very well serve to stabilize the returns and to reduce the risk of farm enterprises.

Some financial observers have made statements that Canada shold return to fixed interest rate financing for agriculture. Such statements or policies in this direction very well may be destabilizing. If there is a fixed level of financial commitment in a variable income market, it will serve to magnify the variability of the net returns to the industry. This leads to the development or examination of the variability of the financial markets as well as the variability of farm income to find financing instruments or tools which begin to match the variability of both of these markets. To the extent that we are able to do so, we can potentially reduce the risk to farm enterprises. When farm incomes go up, the farmer's financing costs would also go up. While this is negative, the more important point is that, when farm incomes are going down, farm financing costs would also go down. As a result, the farmer's payments on his debt would be in conjunction or would be correlated with his farm income, thereby, stabilizing the financial risk of his farm.

It was suggested that debt held by U.S. farmers is projected to increase over the next few years. This I would question. I believe the farm sector is into a period of debt reduction. I make this point because there is a lot of debt, at least in Canada, which is in excess of the farmer's ability to repay. We are entering a period of debt liquidation as lenders write off a certain amount of their debt. In the short run, however, there may be some accumulation of debt through accrued interest, and some accounts may become

delinquent as the problem becomes more serious. However, I think we will see a reduction in the amount of farm debt in the long run.

This leads to a larger question of the use of debt capital to finance the establishment and maintenance of farm operations. For example, in Canada the demand curve for debt capital has shifted significantly to the left of where it was several years ago. I believe that this drop in demand for debt capital will be almost permanent in real terms at this level, with operating returns to agriculture in the order of 4% or 5% maximum. The ability of a farm to carry debt in excess of 30% to 40% of asset values is very much in question, where the operating returns to farm businesses are in the order of 4% to 5%. This suggests that, in order to establish farmers, other means, mechanisms or sources of capital must be utilized.

In summary, the Penson-Romain paper outlines three different scenarios all having different impacts on Canadian farmers. The general point is that what would be good for U.S. farmers may be negative for Canadian farmers. The point is also made that Canadian agriculture has enjoyed the relative level of prosperity because of the high value of the U.S. dollar and the low value of the Canadian dollar relative to it. If the U.S. government is able to better control its deficits, this may increase the competitive position of U.S. farmers and may leave Canada in a worse position. Also the point is made that debt capital as a source of financing for agriculture, particularly to established farmers, is increasingly in question. It is suggested that a hard look should be taken at other sources of capital and at linking the costs of debt financing with the farmer's repayment ability. Finally, the point being made by the paper – with which I agree – is that we are in for a continued period of instability in the financial markets and instability in the agriculture income markets. This instability is a major challenge for policy makers to hopefully reduce in the future.

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Part III

Evaluation

8

Models and the Evaluation of Stabilization Schemes: Discussion

Comment

*Gerry B. H. Parlby**

In usual fashion, I have threshed around until the stock of time available was reduced sufficiently to concentrate the mind so that decisions on what to say have become relatively straightforward. My paper is a series of reflections, given my experience in working with the development of national tripartite stabilization proposals and my limited acquaintance with model building. I trust my fellow panel members will get down to the nuts and bolts about the degree that models reflect reality and the probability that they provide a reasonably sound predicative base for future events.

Let us start with some basics. Webster's *Ninth New Collegiate Dictionary* says that "evaluate" means "to determine the significance or worth of by careful appraisal and study." It further says "stabilize" means "to limit fluctuations of (as prices) or to establish a minimum price for." Finally, it defines "model" as "to produce a representation or simulation of, e.g., using a computer to model a problem." In simple terms, this panel has been asked to address the subject of using representations of simulations of reality to determine the significant or worth of schemes to limit fluctuations of "prices" for red meats. In other words, given a scheme, what will happen? How will the scheme meet the established objectives? How well do models predict these outcomes?

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In the time I am provided, I want to discuss some thoughts on the process of evaluation itself, review various types of models that can be used to evaluate stabilization schemes, look at stabilization objectives and discuss their evaluability, and indicate some of the methods that have been tried in evaluating whether stabilization schemes will meet stated objectives. If I am able to place before you a framework for evaluation and indicate where models fit in, I believe I will have achieved my goals in writing this paper.

Evaluation concepts

Evaluation of government programs is now a burgeoning "soft" social science (Morris and Fitz-Gibbon, 1978). It has its own literature, its own gurus and its own audience. There are other historic forms of evaluation, which we live with every day. They include the marketplace where "price" signals the relative worth of goods or services exchanged between willing buyers and sellers. Our democratic systems of government, though filled with storms, dust and confusion, provide an ultimate statement about how well our social and economic systems are performing. The economic models that economists use are based on evaluation principles established in the marketplace.

Program evaluation techniques directed to determining client satisfaction or utility are based on management science and social science survey principles that do not use measures of "price" and "value of exchange." They are measuring extra market benefits and costs. There is a healthy tension between the market measures of value and the social science measures of client satisfaction.

Program evaluation techniques begin with the explicit definition of goals, objectives or targets. Objectives and/or targets are measurable or they cannot be evaluated. The effects or impacts of a government program may be internal or external. An internal impact would be determined by measuring the effect on client satisfaction, government costs or administrative operations. An external impact would be determined by measuring the supply response in the marketplace with and without the stabilization program. Evaluation of a stabilization scheme can occur *ex ante* (before) or *ex post* (after) its implementation date. Models to evaluate stabilization schemes will be most useful prior to implementation. Empirical measurement will be most useful following implementation. In some cases, though, a model may have to be used as a control, since the real world has the only experimental trial that is occurring. This is often the case with universal government programs. An example of *ex post* program

evaluation is a 1984 study carried out by the Planning Secretariat of Alberta Agriculture for the Alberta Pork Producers Marketing Board on their Market Insurance Plan (Stinson, 1984). Table 8.1 indicates one type of information that was analyzed and tabulated.

TABLE 8.1 RESPONDENTS' RATING OF WHETHER THEIR EXPECTATIONS FOR MEMBERSHIP IN THE PLAN WERE MET

Reason for joining	Expectation realized			
	Yes	No	Partly	Do not know
	(percent)			
Thought it would help stabilize my farming income	47	4	44	3
Thought there would be less risk in my hog operation	68	3	23	5
Thought it would minimize any losses	61	5	34	1
Thought it would help my cash flow	61	1	38	2
It seemed like a good deal at the time	63	6	24	5

Source: C. Gail Stinson, "A Survey Analysis of Producers' Views of the Alberta Pork Producers Meat Insurance Plan," Planning Secretariat, Alberta Agriculture, Edmonton, May 1984.

Finally, evaluations can deal with qualitative methods and opinion or with hard quantitative analysis of individual data points. The former is often termed political debate. The latter is the sanctum of the econometrician and social scientist. Both can be relevant or irrelevant, depending on the decisions to be made.

Economic models

As I understand it, there are various degrees of sophistication in economic models. They are generalizations about dependent and independent variables and can be stated in words, in graphs, in mathematical formulae or in computer language. They all begin by abstracting testable hypotheses from empirical data. Where these hypotheses continually stand up to repeated testing, because they have a high probability of recurrence, they become constructs to a body of theory. That body of theory may be expanded by developing deductive hypotheses that again are tested in the real world. That

body of theory allows for both predictive and descriptive statements about how the world will unfold. The theory can become generated to the point where it is used to say how the world should unfold. Thus, farmers, Members of Parliament, and economists are all using some form of model or some form of generalization to evaluate stabilization schemes. The degree of specification that can occur will narrow the debate to those issues that are of substance.

Most often, it is not the principles or constructs we differ over. Rather, it is the differences in our knowledge about how we predict results. I have spent some time on this area with reason. I can well recall 3 years ago sitting in an office in Winnipeg putting forth the thesis that government contributions to stabilization plans would result in supply response and therefore risk endangering Canadian access to the U.S. through the imposition of tariffs. My simple model said to increase the price per unit and farms would increase production. Others in the meeting argued that there would be little response by producers and little effect on trade relations. Their model may have said that increased farm income would be directed to consumption rather than investment. The decisions taken by government would be more appropriate, if we could at least agree on the relevant relationships and on the direction and probabilities of occurrence of impacts that result from government programs. It sounds simple; it sounds academic.

Let me provide you with two quotes by Wassily Leontief, which may be relevant.

> Nothing reveals the aversion of the great majority of the present-day academic economists for systematic empirical inquiry more than the methodological devices that they employ to avoid or cut short the use of concrete factual information. Instead of constructing theoretical models capable of preserving the identity of hundreds, even thousands of variables needed for concrete description and analysis, they resort to aggregation (Wassily, 1982, pp. 106-07).

> Economics is getting too far removed from observation. Observation must be the origin of the idea.... Then there must be an interplay between observation and theory (Wassily, 1985, p. 30).

I wonder how much of our present prescriptive base for stabilization is founded on economics that has a basis only in academic theory or in intuitive constructs that are aggregated without any repetitive testing or, conversely, through single observations that occurred on Daddy's farm. Let me take this point again by looking at orange juice and weather. Roll (1984) carries out an analysis of the interaction between prices and a truly exogenous determinant of value, the weather. He has this conclusion of interest to our discussion.

> The market price of frozen concentrated orange juice is affected by the weather, particularly by cold temperatures. A statistically significant relation was found between orange juice returns and subsequent errors in temperature forecasts issued by the National Weather Service for the central Florida region, where most orange juices are grown (Roll, 1984, p. 879).

It is simple enough. It makes sense deductively, does it not? Roll goes on to say:

> There is, nevertheless, a puzzle in the orange juice futures market. Even though weather is the obvious and significant influence on the orange crop, weather surprises explain only a fraction of the observed variability in futures prices (Ibid).
>
> No factor was identified that can explain more than a small part of the daily price movement in orange juice futures. There is a large amount of inexplicable price volatility (Ibid).

If our knowledge of the price volatility in the beef sector was as limited, I would have great difficulty thinking that we could develop models by which we could evaluate stabilization schemes in any *ex ante* predictive fashion. I am certain that for many reasons farmers' experience will be limited as well. I am not knocking our academic competence nor our producer experience. I am suggesting that we need to be very aware of the pitfalls that lie ahead in any stabilization scheme to undertake as much preimplementation testing as possible with due respect for our limitations, and to prepare for as much *ex post* evaluation as we can build into the system. The costs of mistakes are high and very real. They will be borne by the farmers and by the taxpayers. In short, there are a number of models we can use for *ex ante* evaluation. These include:

- historical observed relationships in the industry;
- simple static supply/demand concepts;
- econometric analysis, for example, supply elasticities;
- computer modeling.

My list is certainly not exhaustive. To some extent, all have been used in attempting to evaluate the impact of stabilization schemes on the livestock sector in Alberta.

Objectives

The kicker in evaluating stabilization schemes is to have clearly explicit objectives that are quantitatively measurable. Since there is a mixed bag of wants by producers, their organizations, the federal government and the provinces, the task of developing explicit measurable objectives is difficult. I am certain that many of us are still not sure what the objectives of stabilization schemes are. Most proponents of stabilization schemes are still mixing the opportunity for farmers to voluntarily enter a scheme to average

their returns due to cyclical price movements with the need to provide relative certainty of a high net return to investment at all times. Is it income variability that is being addressed, or is it the level of income over time that is being corrected? There is no answer. The need to rationalize objectives is also important to allow for the evaluation of stabilization schemes through the use of models. The good news is that the present national tripartite proposals do provide some criteria for measurement. These include the following provisions:

- support levels would be uniform nationally, with no top-loading by participating provinces;
- premiums would be shared equally by the two levels of government and producers, each contributing one-third;
- the program would be voluntary for producers;
- the program must be actuarily sound;
- the program should be at a level that limits losses but does not stimulate production;
- the marketplace is left free to operate efficiently, such that the program is market neutral.

It is possible to test some of these objectives by using models to see what may happen. In particular, supply response may be tested by empirical historical observation, by comparative model testing or by within-model analysis.

As for empirical historical observation, in Alberta, we wanted to see whether regional shifts in production could result following the implementation of the beef stabilization scheme. There is little documentation and few models are available, apart from the work of Martin and Haack (1977) at Guelph. The question was asked, What is the probability the national tripartite stabilization proposals for the cow-calf sector would shift the regional location of cow-calf production in Canada? Empirically, much work had been completed on forage and pasture supplies and on cow-calf numbers. If national plans were likely to shift regional production, one would expect that changes in price relationships and availability of resources would have caused serious shifts in the past. Our tentative conclusions were that not much change would occur in regional location of the cow-calf industry because of the national tripartite proposals, given historical relationships with respect to beef cow numbers and available pasture and forage and given the relative changes in costs and profitability in other production opportunities overtime. The analysis did not take into account recent drought or grasshoppers, nor should it. Figures 8.1 to 8.6 provide the basis of this analysis.

FIGURE 8.1 TOTAL IMPROVED LAND AREA BY PROVINCE, CENSUS YEARS 1951-81

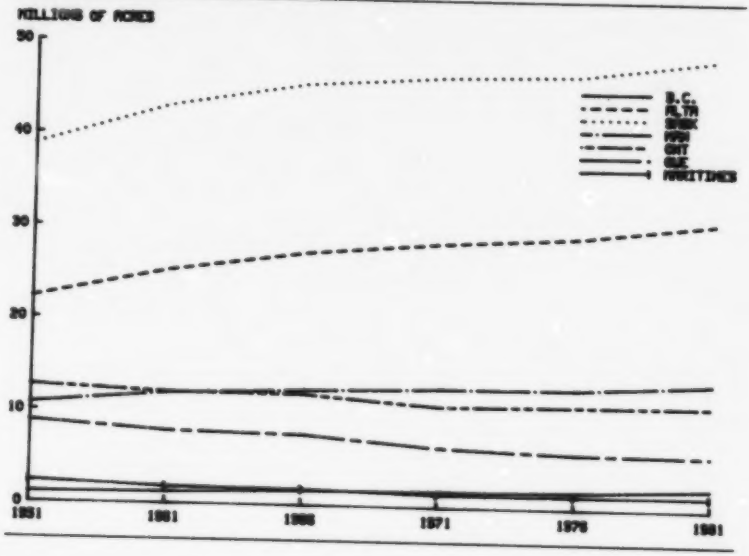


FIGURE 8.2 TOTAL OTHER UNIMPROVED LAND AREA BY PROVINCE, CENSUS YEARS 1951-81

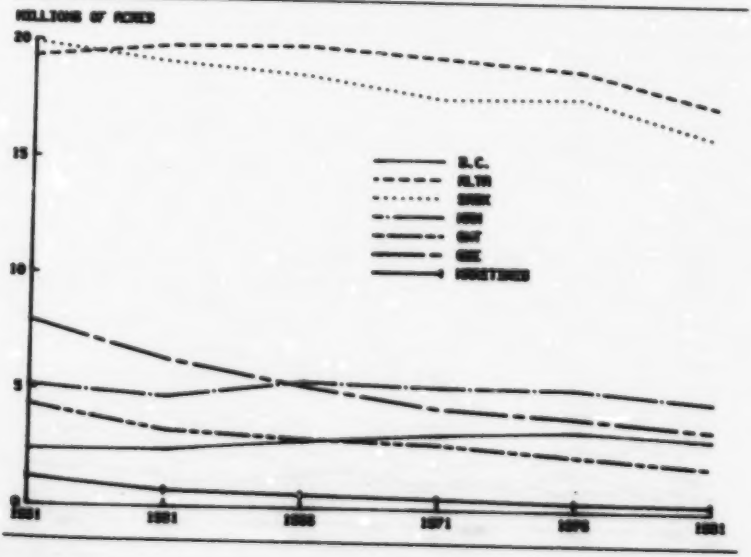


FIGURE 8.3 TOTAL IMPROVED PASTURE AREA BY PROVINCE, CENSUS YEARS 1951-81

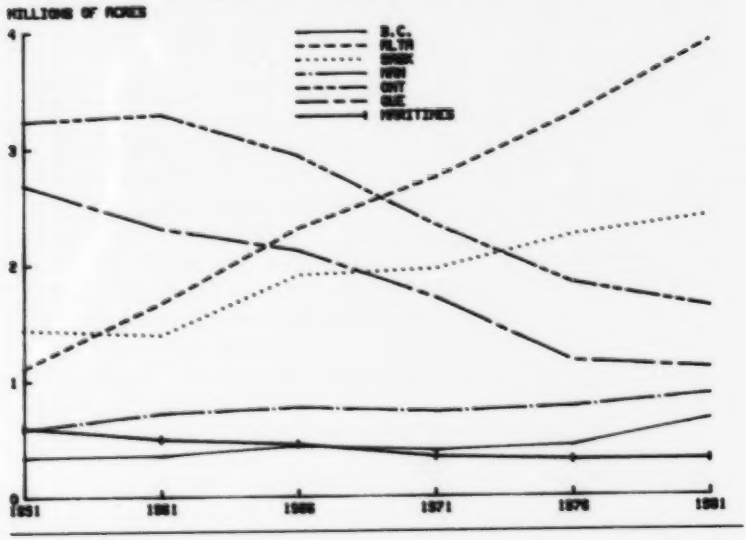


FIGURE 8.4 TOTAL PRODUCTION BY PROVINCE, 1952-82

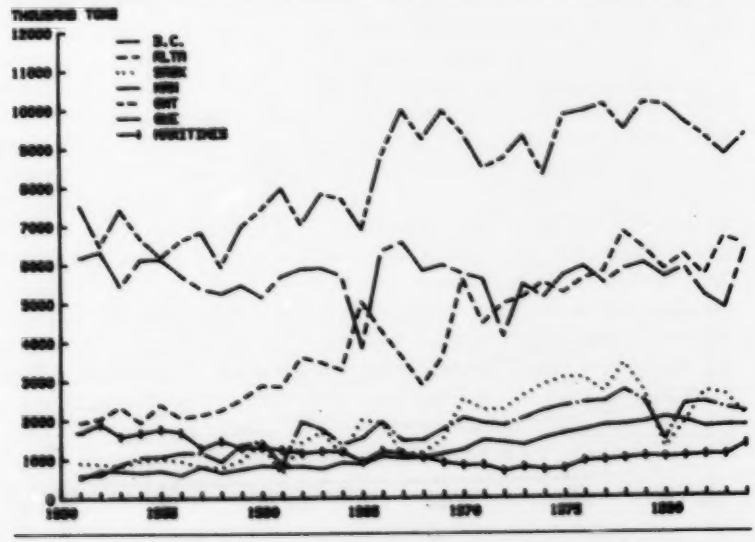


FIGURE 8.5 TOTAL NUMBER OF COWS BY PROVINCE, CENSUS YEARS, 1951-81

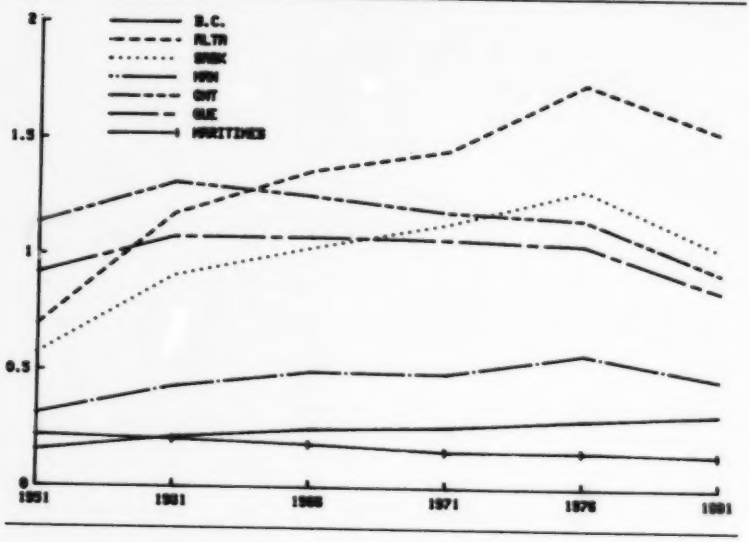


FIGURE 8.6 TOTAL BEEF COWS BY PROVINCE, CENSUS YEARS, 1951-81

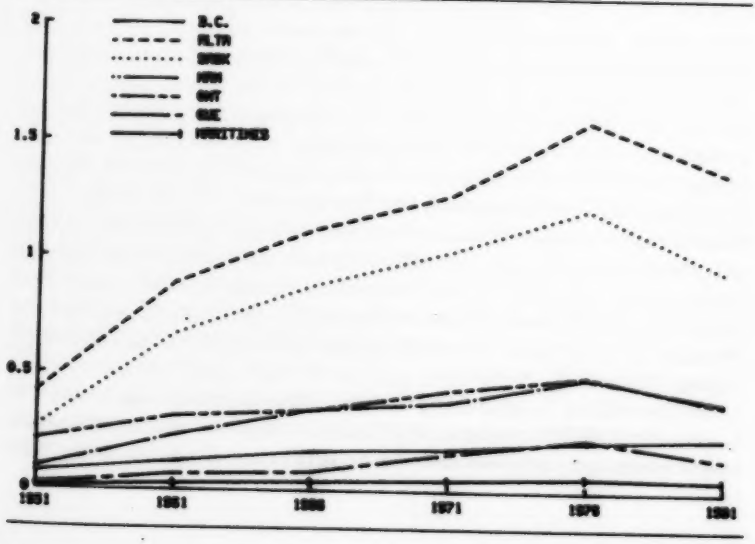
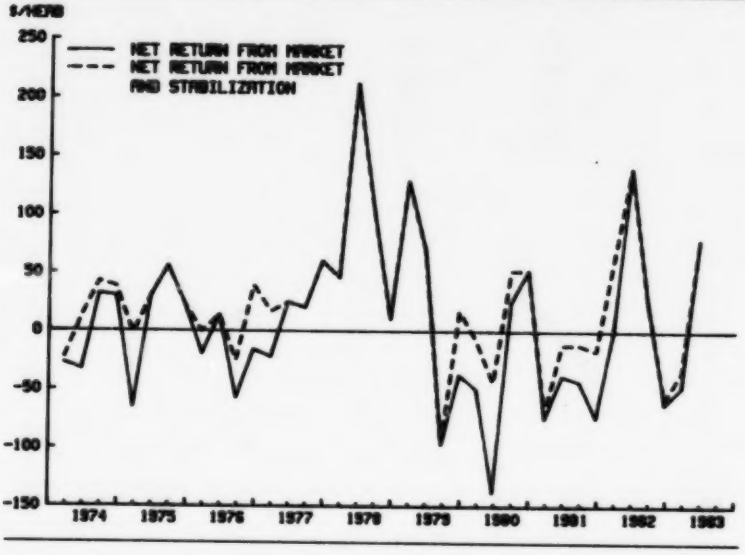


FIGURE 8.7 YEARLING STEER MARKET AND STABILIZATION MARKETS, 50% GUARANTEED MARGIN



As for comparative model testing, Dawson Dau and Associates (1984) developed criteria to test for performance in payments between their model for Alberta and the national models. This was done to see whether any particular payment scheme looked better for Alberta producers. Criteria were frequency of overpayments, frequency of missed payments, frequency of unnecessary payments, and the average proportion of the loss covered under Alberta budget conditions. Figure 8.7 shows the results for the 50% guaranteed margin and 93% Agricultural Stabilization (ASA) approaches for yearling steers tested against the Dawson Dau Alberta model. The guaranteed margin approach specifies a support price equal to cash costs plus a percentage (say 50%) of the margin between prices and cash costs. The ASA approach specifies a support price equal to a percentage of historical prices (say 93%) plus an adjustment for changes in cash costs. Table 8.2 shows the general results for all criteria tested.

Within-model analyses must take into account that a central thesis of the design of the national tripartite stabilization proposals is for payments to producers to be uniform across Canada. The

TABLE 8.2 COMPARISON OF ESTIMATES OR PERFORMANCE FOR SLAUGHTER CATTLE OPERATIONS[a]

Proposal	Over-payment[b]		Missed payments[b]		Unnecessary payments[b]		Average loss minus payment	
	Guaranteed margin	ASA	Guaranteed margin	ASA	Guaranteed margin	ASA	Guaranteed margin	ASA
For yearling steers	6	6	1	4	4	3	23.48	26.09
For yearling heifers	9	7	3	6	3	2	14.78	17.10

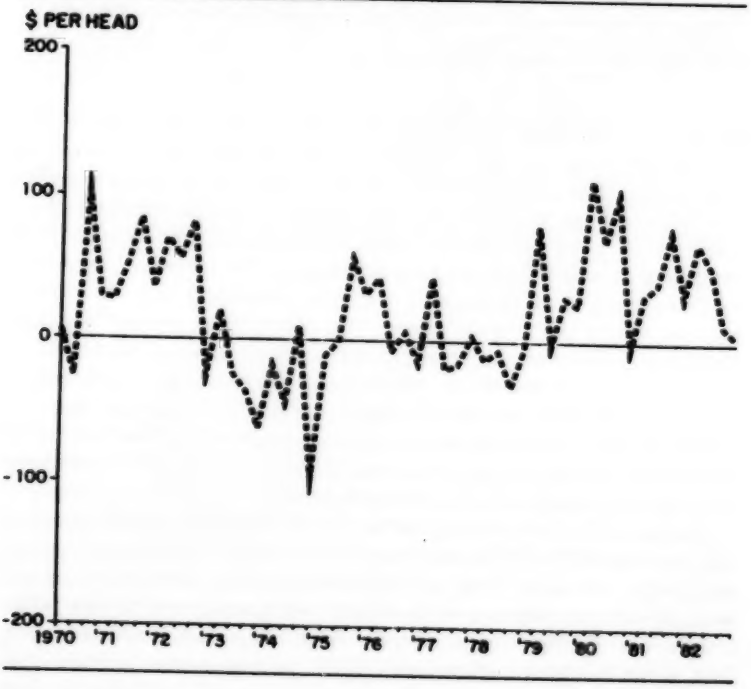
[a] Depending on importance between criteria, one's selection between proposals could be weighted accordingly.
[b] Figures show the number of occurrences.

basis of this principle lies in the need to prevent escalation of the size of payment in one region versus another as a result of inadequate data measurement, while, since price is arbitraged across Canada as well as within the larger North American market, there is no need to address regional costs of production. The reasoning is based on the construct that, at the margin, there will be some firms in all regions that will be producing at a cost where returns equal price over time. In short, the market already allocates production regionally, taking into account distance to consumer markets and availability of nature resources. Nevertheless, it is considered that there may be some value, on a "need to know" basis to see how national models might behave with regard to regional competitiveness of the industry, given uniform stabilization payments across the country.

Output data were provided to the Secretariat on the present federal models for short and long keep steers. Differences in net margins, calculated from gross revenue minus cash costs minus producer stabilization contributions, were analyzed to see what trends were being calculated over time. The line of reasoning is that, if net margins were increasing in one region over another, the size of stabilization payment would cover more of the losses in that region than in another. Figures 8.8 and 8.9 indicate the results of this analysis. While there are some recent trends toward higher margins in the East, there is nothing conclusive. It was recognized that the Agriculture Canada models are based on a 500-head farm feedlot, whereas a major proportion of western finishing occurs in feedlots of a significantly larger scale, where both plant and market

economies of scale are evident. The change in net margins regionally is more a function of competitiveness than something that needs to be addressed through a national stabilization model. Other policy variables such as "payment to the farmer" under grain transportation funding by the federal government and improvements to market performance via FOB plant pricing would do more to address regional concerns than adjustments to a national tripartite stabilization plan.

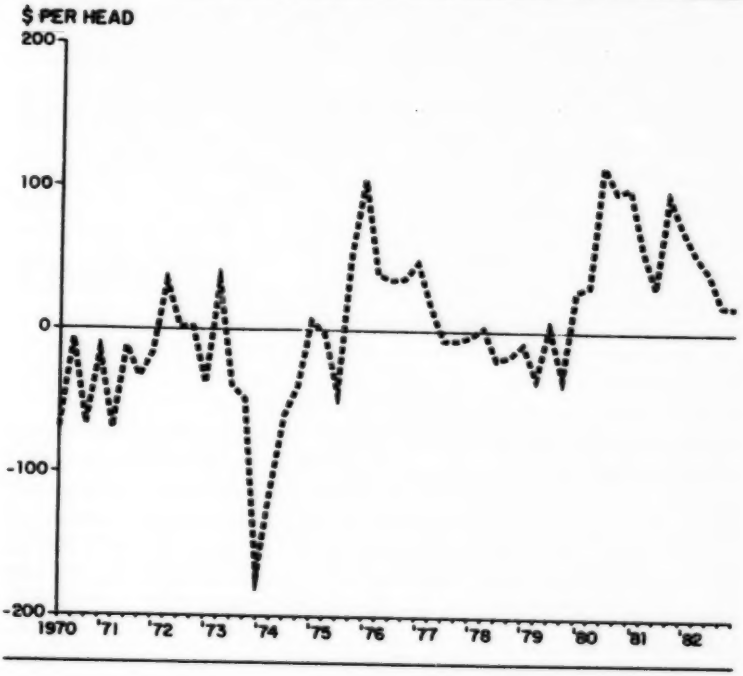
FIGURE 8.8 DIFFERENCE IN NET MARGINS (EAST-WEST) SHORT KEEP STEERS (CONSTANT 1983 DOLLARS), 1970-82



Summary

- There are differing forms of evaluation, including price, client satisfaction and political acceptability.

FIGURE 8.9 DIFFERENCE IN NET MARGINS (EAST-WEST) LONG KEEP STEERS (CONSTANT 1983 DOLLARS), 1970-82



- Program evaluation depends on explicit definition of goals, objectives and/or targets. Objectives and targets should be measurable.
- Evaluation may be internal or external, *ex ante* or *ex post* and qualitative or quantitative.
- Economic models can be stated in words, in graphs, in mathematical formulae or in computer language. There is a need to continually retest the probability that these models are relevant and do reflect current observations about reality. The degree of specification achieved will narrow the debate to issues of substance. The costs of mistakes will be borne by farmers and taxpayers.

- The implicit mixed objectives of many stabilization schemes make evaluation of these schemes difficult unless those objectives are made explicit. National tripartite proposals do have explicit criteria.
- Methods used in Alberta in evaluating stabilization schemes include historical observation, comparative model testing and within model analyses.

In aggregate, *ex ante* evaluation of stabilization schemes to date has been limited. This paper does not address the use of industry models such as those developed by Martin and Haack (1977) at Guelph.

Comment

*Brian Paddock**

My exposure to red meat stabilization or beef stabilization began about 10 years ago. I participated in some analysis about 10 years ago when amendments were made to the Agriculture Stabilization Act (ASA). Many of the things I am going to mention here relate to grain stabilization in the context of both the Western Grain Stabilization Act and the ASA. However, I believe that many of the observations will be equally relevent today.

First, I will make observations on the stabilization policy arena in terms of the demand being placed on that arena. I would then like to turn to some remarks of what sorts of information are required for decision to be made. I think in many cases, these needs are not restricted to stabilization; many of the same types of information are increasingly required for all sorts of policy decisions. Then I will have a few remarks on the technical aspects of how we design models to evaluate stabilization policies.

It seems evident that there is an increasing demand for stabilization schemes. This is partly a result of what one could call the legacy of Keynes and the Depression of the 1930s, in a sense. It is more or less accepted now that government has a responsibility to stabilize markets. For most sectors, governments' stabilization objectives are implemented through the establishment of

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appropriate monetary and fiscal policy. In addition, through the unemployment insurance program, the federal government provides protection for labor earnings. In the case of agriculture, however, it has been recognized that, because of its large exposure to international markets, stabilization of aggregate demand in the domestic economy is not sufficient to stabilize returns to agriculture. Furthermore, the owner-operator structure in place on most farms means that programs such as unemployment insurance are not capable of supporting labor income in agriculture.

Another factor behind the increased demand for domestic stabilization schemes is the increased instability observed in commodity markets. Whether it is a cause of this instability or a result of it, international commodity agreements are increasingly viewed as unworkable or ineffective. At the same time, production enterprises are more highly leveraged and increasingly specialized. Both of these factors make farm enterprises more vulnerable to fluctuations in market prices. As a result, producers are demanding domestic programs to provide protection from market instability. Finally, the fact that farmers are becoming increasingly well organized has made it possible for them to make the case for agricultural stabilization much more forcefully.

In responding to this demand, stabilization has been treated as a policy objective in and of itself. As such, it did not need to be and was usually not justified in terms of its contribution to other policy objectives. In assessing specific program proposals, it was necessary only to estimate the reduction in instability which would result from implementation of the program and the cost of achieving it. However, because of the pressure to reduce deficits, there is increasing competition for government funds. Therefore, stabilization claims are increasingly going to have to compete for funds with all sorts of government activities. Furthermore, it appears government activity will become increasingly oriented toward promoting economic growth.

What does this mean for what we as model builders are going to have to deliver? One implication is that our assessment of stabilization programs will need to take into account explicitly and quantitatively other benefits of stabilization, including benefits which have not been much talked about to date. It seems reasonable that, when one compares the benefits of a stabilization program with those generated by a research program that is going to increase productivity or with a program to develop new markets for agricultural products, documentation of these types of benefits

will be increasingly important. Such benefits might be categorized under the following headings.

Increased economic growth There has been some discussion here about the fact that, in some of the stabilization models, we have not looked at the potential production increases that are generated by pure stabilization scheme. That is, the increase in output occurs simply because price or net returns are stabilized rather than increased. To the extent that increased output does occur, it could result in increased opportunities for investment in food processing with accompanying benefits in terms of employment and economic growth.

More stable output To the extent that producers' returns are stabilized, one might expect output levels to be stabilized as well. This would improve capacity utilization not only at the farm level but also at the processing level in many cases, thereby providing an additional stimulus to investment. It could also be important in securing export markets where a stable supply is often important.

More efficient resource choice One can go back one step back into the firm and ask, What is the implication of these stabilization programs for their choice of resources in production? If producers are confident of a more stable environment for production, are they likely to be more willing to undertake investments in fixed capital as opposed to varible capital? If fluctuations in returns are reduced, would producers also be more inclined to invest in becoming efficient, as opposed to being more flexible? It will be very important if, in proposing a stabilization plan, one can document that, as a result of this plan, the average cost of production in a pork production unit or beef production unit will fall by 1% or 2% because of the more stable environment.

Reduced input costs One of the benefits often claimed for supply management schemes, and the dairy program in particular, is that it allows producers to lower their input costs. A dairy producer can go to his banker and, because he has a quota and relatively fixed price for his product, he can get either more credit or credit at a lower rate of interest. It would be interesting to know whether there are differences in credit terms between participants and nonparticipants in U.S. farm programs. It seems to me that this sort of impact could affect the Minister's decision on where to put resources.

I think these aspects will be increasingly important, yet they have been addressed very little, if at all, in discussions of stabilization policy. In some respects, the economic theories exist to handle some of these problems but, with the exception of some of

the work done by Just in the early 1970s, it has not, so far as I know, found its way into the applied literature in the aggregate sense.

I think there is also going to be an increased requirement for analysis of the grass roots impact of these stabilization programs. Most of the analysis which has been done has looked only at the aggregate impacts of stabilization programs. The assessment goes something like this. A plan is implemented, it makes payments of X million dollars and it stabilizes aggregate net cash flow or some other aggregate target variable by Y percent. This is how we measure the benefits. It seems to me that politicians increasingly want to know how this program impacts on real people. Let me give you an example to illustrate the type of information that is going to be increasingly required.

Under the Western Grain Stabilization Act, the net cash flow accruing to Prairie farmers from the seven major grains produced in the region is stabilized jointly. Because wheat accounts for about 60% of cash receipts from grains, a payout will not be triggered under this program unless the wheat market is depressed, regardless of the conditions of the markets for coarse grains and oilseeds. Yet there are some regions within the Prairies in which not much wheat is produced. The question then arises, Given that the program is successful at the aggregate level, how well does it contribute to stabilizing the net cash flow of farmers in a region where the production pattern deviates significantly from the Prairie average? By and large with the models we have in hand, it is difficult to respond to such a question. One can get some idea by looking at marketings of each grain in different regions, but it is difficult to be sufficiently precise.

I think we are going to have to start looking also at the implications of stabilization payments for different farm structures. Farms have different financial structures; some are highly leveraged and some are not; farms are of widely differing sizes; and some are more diversified than others. Along with the aggregate analysis, more information on a disaggregated level will be required, so that politicians can respond and know what certain aggregate programs are going to mean in very specific situations.

Finally, I think we are going to have to do more work in terms of analyzing the impact of these programs on farm structure itself. If producers of different sizes have different attitudes toward risk, then it follows that a program which impacts on the amount of risk in the market over the long term is also going to impact on the structure of the farm.

I now would like to turn to a few points on technical aspects of modeling stabilization programs. The first thing that struck me was that, in the 2 days of this workshop, we have not been very specific on just how stabilization payments should be modeled. In the paper presented by Charlebois and Cluff in the model with the current ASA program, payments were specified as part of the price while they were received. Yet for the new program, the authors assume that producers could in fact anticipate when the payment was going to be made, and they specified it in a sort of anticipatory sense. Consequently, the differences attributed to the program may reflect only the difference in how the price expectations were affected by stabilization payments, rather than in how the program was structured. This particular example only highlights the fact that not enough is known about how producers respond to stabilization programs. In many ways, the methodologies being used now are not very different from those used 15 years ago, when analytical work on Canadian stabilization programs was beginning.

I am also a little surprised that the models presented here do not attempt to capture the impact of reduced instability on output, since such impacts have been successfully measured in other contexts and have been found to be quite important.

Finally, there has been a good deal of discussion during the workshop about the usefulness of sensitivity analysis when there is uncertainty about the values of certain parameters. From an economist's point of view, this seems quite attractive. However, for decision makers, such analysis may be much less satisfactory. Unless probabilities can be attached to the various outcomes, such analysis may be of little help in decision making.

Comment

*William H. Meyers and Stanley R. Johnson**

What have we learned from this symposium? The major lessons fall into the following three areas. First, what kind of information is needed by policy participants for evaluating stabilization schemes?

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Second, what are the desirable characteristics of models that generate such information? Third, what are the limitations in the models we are currently working with or seem to be working with in evaluating and designing stabilization policies.

Information needed

It is useful to remind ourselves that the government is not the only organization needing information about stabilization policies. Policy participants include private participants in the industry, such as the Canadian Cattlemen's Association and other groups. In general, these groups, whether government or private, require accurate and easily accessible information on net gains and losses from policy and on the distribution of gains and losses. The variables of interest include a number that were reported in the various analyses presented during the course of this symposium.

Market variables involve prices and quantities, including production along with use and trade and similar information concerning interaction among the program commodities of interest. For example, for beef stabilization, effects of commodity interaction will likely produce impacts in the feed grains sector. Similarly, grain program stabilization policies would likely have impacts on the livestock sector.

Industry variables include farm incomes for the different subsectors and for agriculture as a whole. The CPI for food is a measure of the retail impact on consumers. Another example would be effects of the farm input markets. Still another area for industry impacts is financial. In the United States, for example, we are now beginning to investigate much more carefully how changes in commodity programs impact debt service in the agriculture sector. Bankers and the federal farm lending system are quite interested. Also, debt servicing capacity is a measure of the well-being of producers, showing how particular commodity programs influence their financial condition.

Government cost and revenue variables almost always involve the cost side. In some types of programs, there may be effects on the revenue side as well. In evaluating these costs and revenues, it is important to use the correct economic concepts. For example, while supply control policies may not have high direct government costs, they may have high social costs.

A macroeconomic performance variable that comes directly from the agricultural sector is the effect of agricultural policy on the general CPI and on the balance of payments for countries where agricultural trade is important, such as Canada and the United

States (this is probably not so much the case for the beef industry but is certainly a factor for other commodities). Another important macroeconomic feedback is through debt service, because of the financial situation. Could failure to service agricultural debt have a feedback into general financial markets? If these effects become significant enough, there could be general financial market impacts. At the other end of the spectrum, performance variables that relate to the distribution of impacts by location, type of operation and size may be important.

Finally, after viewing the different sets of performance variables that might be generated, the general sensitivity of these variables to various external conditions should be evaluated. We reviewed examples of this sensitivity testing in the results that were presented. These sensitivity analyses are particularly important to stabilization program design, operation and evaluation. In operating the programs, we are interested not only in average levels of prices or incomes, for example, but also in their variability. In order to estimate variability, we must utilize some kind of conditional analysis.

Desirable characteristics

The first few points are on structural validity. We simply must spend time identifying "correct" elasticities of, say, demand for pork or beef or whatever. In the United States, we have been reviewing the elasticity of demand for exports and how the value of this elasticity influences the choice of price support policy. It is clear that those of us working on commodity market models are not all in agreement about the parameters. Thus, when we do analysis, there is uncertainty not only about demand and supply and weather conditions, but also about the levels of the structural parameters themselves. In addition to disagreement on the levels, there is also a question about changes in these parameter values over time. If we are using a 10-year time horizon, for example, what changes in the key behavioral parameters may occur over the time period?

A second area on model charactereistics is the expectations mechanism employed. This problem was also raised during this symposium. We have not discussed expectations completely, but the modeling of expectations is an important issue. What is it that producers actually use as expected prices when making production decisions? We may assume a certain modeling approach. However, we must also try to determine how closely these assumptions approximate reality.

A third area is the risk response. Risk response is an area that we know we should include but, for one reason or another, we do not simply, because we do not have the proper kind of specification included.

Fourth, there is the Lucas critique mentioned in the Martin-Meilke paper (Chapter 5). That is, when we go from one policy regime to another, the behavioral parameters change as a result of the producers' and consumers' knowledge that they are in a different policy regime. We can react by throwing up our hands and saying we do not know anything about how such changes occur and, in so doing, immobilize ourselves. Or we can try to anticipate the direction of these changes and qualitative responses. In many cases, we do not have data to evaluate or test these change hypotheses. But we usually have a theoretical basis for knowing their direction. Many times these kinds of structural issues can in fact be dealt with by sensitivity testing of the kind we do when we are unsure about the other aspects of the model structure.

Fifth, in analysis of stabilization programs, it is more appropriate to use stochastic rather than deterministic simulation. This is a little bit more difficult but will generate the distributions as well as the means of the variables of interest.

Sixth, microeconomic or firm level models should be applied in addition to the aggregate models that we have typically used for this analysis. These models are important in developing distributional effects by type of farm or location and other features. These factors cannot really be captured in the aggregate models. Hence, appropriate linkages of our aggregate results to microeconomic or firm level models will be useful in adding to the information that can be generated on stabilization policy impacts and design.

Seventh, on the characteristics of models that permit analysis of macroeconomic feedbacks, there was discussion during the workshop on whether or not there is feedback. Often we develop our agricultural analysis as if everything came from the macro sector recursively and had no feedback. There are potential feedbacks, even though agriculture is fairly small. These can occur through the trade balances, the CPI or the financial markets, as mentioned earlier. The point is that full analyses of these stabilization policies require a broad modeling system, one governed by empirical information on feedbacks, not just by assumptions.

Finally, for model characteristics, there is the issue of endogenous policy formulation. That is, we should consider how policy makers either domestically or abroad might react to the kind of policy that we are evaluating. It is fairly clear that modeling government behavior is very difficult. We have not made much progresss in this area in the profession. However, we must conclude that government reactions are important, just as we have observed recently, where the U.S. policy changed in a reaction to Canadian pork policies. When we observe this sort of reaction, it provides additional information for modeling endogenous government behavior.

Limitations of current models

First, there is an important difference between the proposed program design that we evaluate and the program actually put into place. As implemented, the program is not likely to follow the rigid rules used in the analysis. We have as an example in the United States the grain reserve program, which was designed as a stabilization program and even was operated as a stabilization program for a limited period of time. Then, because of political pressures, this stabilization program actually became more of an income enhancement or price enhancement program. As a result, the stabilization program became imbalanced as a buffer stock program. The price range boundaries implied by the program provisions were simply in the wrong place.

We have recently reviewed a number of analyses of the U.S. grain reserve program. Those that were conducted before the fact were typically done with a fixed set of rules looking into the future. These analyses generally gave the expected result that the programs reduced the variability of prices but did not change the average price level much. However, when counterfactual analyses were applied, in other words, when actual performance over the past 5 years was evaluated, the results were not so clear-cut. In almost all cases the mean level of prices was increased and, in a couple of cases, results indicated that the programs were actually destabilizing rather than stabilizing. There is not much we can do in advance about the misuse of stabilization schemes. We are simply not sure how programs, once in place, might be misused. It would be nice if we could develop foolproof programs not quite so susceptible to mercurial change induced by political pressures.

A second limitation is an empirical limitation in the state of practice. That is, although we sometimes know the right type of analysis to develop, we may not do it for empirical reasons. In many cases, there are data limitations, as in the endogenous policy modeling, for example. In cases involving participation decisions in voluntary programs, there may simply be no data. Also, there may be data limitations that restrict selection of functional forms or the use of time variant parameters to accommodate a behavioral change. This empirical lag in our analytical work might be just a time problem. In responding to questions of a policy nature, the research might not be there at the appropriate time. As researchers, we must try to anticipate analytical requirements and have the work on the shelf available when it is needed. Reactionary policy analysis is usually not well received. One factor that causes our empirical work to lag behind the state of the art is that we all often desire or need simplicity in our analytical models and opt for simplicity over what may be more appropriate from a modeling point of view. The cost of complexity is declining, however, so maybe we do not have to worry as much as we used to about model scale.

Finally, there is the theoretical state of the art, the issues that were raised by Choi and Johnson in their presentation. There are really a number of theoretical issues relating to stabilization in a market equilibrium environment, which have yet to be completely understood. In fact, most of the stabilization literature focuses on the firm level rather than on the aggregate level. Moreover, the incorporation of risk response in aggregate supply relationships is not very well developed. Much of the risk response work is at the microeconomic level. To go from the micro models to aggregate supply functions with appropriate risk responses is an area that needs further work.

So there are challenges for us to face on the theoretical level, on the empirical level and on the communication level. Effective policy analysis involves all of these aspects, and there is ample work to be done in each of them.

Comment

*Charles Gracey**

I am always impressed by the dispassionate way in which economists discuss issues that affect us directly. I commend them for it but what I have to say will be more than a change of pace, because I cannot discuss this issue dispassionately.

I was asked to comment on stabilization. On June 20, 1985, Bill C-25, which is an amendment to the existing Agricultural Stabilization Act designed to permit new stabilization programs, was amended. This amendment to Bill C-25 will permit provinces to add their own programs on top of federal ones. Cattlemen have fought long and hard to prevent this. My initial reaction is admittedly a knee jerk reaction, but I do want to give you my first impressions of this amendment.

The livestock industry in Canada and, I am sure, in the United States suffers a marked dichotomy of attitudes and philosophies as regards stabilization.

The two schools of thought that I have experienced are poles apart and could not be more mutually exclusive. On the one hand, there is the distinctly conservative view that no program is required or desired. This is not simply a doctrinaire or unsophisticated view; it is premised upon a clear understanding that program benefits tend to be capitalized into productive resources. It recognizes that serious trade tensions can arise, especially with our most important trading partners. It recognizes fundamentally that the best economic model yet devised or likely to be devised is the marketplace and the dollar bill. This view is held by those confident of success in the competitive environment nationally and internationally.

The polar view of this is the unsophisticated and essentially careless view that federal and/or provincial treasuries are there for the plundering. The legitimacy of this view arises from the profligacy of politicians and the belief rooted in the 1960s and 1970s that no agricultural problem was large enough not to be solvable with vast amounts of transfer payments. As I have said before, we are living on the dying edge of that belief. Those who protested that

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treasuries were not bottomless appeared at times to be false prophets. I am one of them. The continued existence of gluttonous plundering of the treasury by the Canadian Dairy Commission is Exhibit A to my argument. The arbitrary opportunistic payout of $63 million to the hog industry a few days before the last federal election is Exhibit B. Never before was more money spent to elect one Member of Parliament.

In short, those of us who favor the market economy have suffered a severe loss of credibility. The capitulation of the Hon. John Wise to Quebec's filabuster on tripartite stabilization, which will now allow for a measure of top-loading and/or regional recognition of costs, now ranks as Exhibit C.

I heard this morning a lot of confusion and interest from the Americans particularly concerning the question on what we are trying to stabilize and why we are trying to do it. I am going to try to answer it.

It is against this background of accurate anticipation of further Balkanization of our market that the Canadian Cattlemen's Association made a radical change in policy in the summer of 1981. Prior to that moment, we had taken an essentially antistabilization stance. However, we came to recognize that the national integrity of our industry and market had to supercede our noninterventionist stance. We anticipated and greatly feared an escalation of Balkanization, leading inevitably, if not to the destruction, then to the fundamental changing of our industry, either through the route of supply management or countervail action from our trading partners. It is important to note that, at this point, the thrust for tripartite stabilization was instituted by the cattlemen, quickly endorsed by the hog industry and shortly thereafter supported by provincial governments, particularly Ontario, Saskatchewan, Alberta and Manitoba, which were then joined by others. Leadership from Agriculture Canada was largely confined to the heroic and courageous effort of one Gilles Lavoie, the director general of Farm Income Services at Agriculture Canada, a man to whom I cannot pay enough tribute. To think that Gilles had to cut his heart out – and he may deny he did it – and had to write destructive amendments to Bill C-25 after 3 years of trying to get the thing through is one of the supreme ironies of farm policy formation in this country.

Our direction on tripartite stabilization was credible, I think. We sought above all else to create for our industry a "level playing field," in which producers would not receive any preferential treatment according to the province they live in. We argued that a

level playing field could not be achieved by redressing all regional economic disadvantages. We in fact enshrined regional economic advantage as an inviolate principle, vitally crucial to Canadian agriculture. The reason this is crucial is clear. Canadian agriculture ranks throughout the world as one of the highest in proportion of its production exported. Those of us who forget it, who forget that we earn 42% to 50% of our gross farm income in the export market, and who think that we can do things that can one day become subject to countervail are not serving agriculture at all.

I will not recount in detail the history of 3 years of concerted effort by the tripartite stabilization task force. I will tell you this much. We fought, argued and conjoled the basic principles of regional economic advantage and national integrity and one market. These remarks about national integrity and one market may sound strange to our American friends, but we have a much more fragmented market than you have. What bothers me is that we won every argument, and the plan that was developed reflects this victory. But we lost most of the battle when politicians on the government side executed a filabuster and threatened division in the House of Commons on the vote. These political threats were served, and the plan we have developed has been castrated by an amendment to permit a measure of top-loading, a measure of regional cost redressing and so on and so forth. The federal Minister of Agriculture was in a duel with counterparts from Quebec and British Columbia and he threw his sword away. He can no longer employ the discipline of refusing to pay federal funds to top-loading provinces. Let us be clear that the effort of the task force was to discover the lowest common denominator of public support that was politically acceptable. Now the only possible resolution that I can see will come at the highest common denominator.

I have traveled across this country for many years and I have yet to land in a province where producers cannot argue persuasively and convincingly to me that their costs are the highest for a series of reasons.

Now I want to clarify what our motives really were. I note confusion because the question of what it is we wish to stabilize has been raised repeatedly this morning. Our main motive was not to stabilize the industry. We still respect and believe in the market. Our motive was clearly and inescapably to stabilize policy. We wanted a policy to stabilize policy. I can still tell you with great confidence that the majority of cattlemen – I cannot speak for hogmen today – want no program. What they resent is the inequity

that threatens their future. There are exceptions, of course; they tend to be best expressed by failing producers. But most have an intuitive sense of reality that agriculture cannot be sustained by subsidy, because subsidies in whatever form are quickly capitalized. We also sought a low-level program as a measure that hopefully would attract no countervail.

Canada therefore has to face reality. We can bemoan as much as we like the elephant-and-mouse syndrome, but it is becoming tiresomely repetitive to me. I have heard it for 15 years; every speaker worth his salt refers to the American elephant and the Canadian mouse. I say it is tiresome because none of our bitching or complaining will alter the relative size of the two countries now or in the future. Nothing will change the fact that 85% of our livestock exports go to the U.S. market. We will learn to like it, prosper from it and preserve it, or lump it. We cannot and must not idle 20% of our livestock productive capacity just because we cannot or will not accept the essentially fair rules of the game.

The U.S. countervail against pork and hogs is a case in point. When we were fighting for tripartite stabilization, we feared countervail as a theoretical possibility. Before we finished, it became a practical reality. I think you could take any group of hogmen, put them in a room, not to talk about hogs or the U.S.-Canada situation, but to talk about some other commodity like baseball bats and to describe the scenerio that has emerged. I have utter confidence that there would not be a hogman in Canada who would not side with the position the Americans took. It is not for the Americans to ask us why we increased our hog production 97% since 1978 and held it flat at that level since, whereas the Americans have gone through two hog cycles, with production fluctuating 10% to 12%. We cannot say we did not even see the countervail coming. Having said this, I want to say as well that I take no pleasure in it because the impact on the cattle industry is as great as the impact on the hog industry pricewise. Moreover, the cattle industry in Canada can claim to be no purer than the hog industry. We have programs that, in my view, are subject to countervails. Furthermore, we cannot challenge the Americans, if they wish to impose countervails on us, and then pretend that we are correct to attack the Europeans for dumping export-subsidized beef in our market.

Where do we go from here? I have tried to give you the background. Maybe I should back up and qualify this a bit. Maybe the amendments that have been offered to this stabilization bill are not as bad as they appear on the surface; maybe the onus will be

placed on provinces to justify their top-loading; but I cannot see it myself. The justification will have to be related to their arguments that their costs are higher than somebody else's. This is an argument we dismissed a long time ago. We do not care whose costs are highest; we believe production should occur in that region or area which has the economic advantage. The only way we can maximize our export potential is to maintain production in areas having regional advantage, instead of relocating it in areas of political advantage, which is what is being encouraged with the new legislation.

Where do we go from here? I am not sure at all. We have lost a very big round. Essentially, it was lost not through lack of effort on the part of the task force itself but through the exigencies of political considerations.

I want to conclude with just a few thoughts. I was really impressed with the Penson-Romain paper. I think that they have made a convert of me. One of the things that does impress me about economists is how they can suddenly explain lucidly to me things that I have worried about for years, and this paper did it. The point is that the macroeconomic policies that impact upon agriculture are much more important to us than anything we can do at the commodity level. I cannot help but remember, during the fall of 1979 when we were invited to appear before the House of Commons Standing Committee on Finance, Trade and Economic Affairs to comment on the impact that rising interest rates would have on the fate of the cattle industry, we were not very accurate in our forecast, because we did not paint the picture nearly as bleak as it has since evolved. But we did say that there would be a rundown of the cow herd, that farmers were captive users of credit, and that it would impact on agriculture more than almost anything else in the economy. When we finished, we were told quite bluntly that we were economically illiterate and that this was good for Canada. I guess we are still economically illiterate, but it pleases me to have been economically illiterate and right, rather than economically astute and wrong. In agriculture now, I think that one of the problems we have in Canada and undoubtly in the United States, as I heard one of the Americans say this morning, is that we do not have a coherent agricultural policy. I think, far from agreeing with the gentlemen this morning who accused someone of a cop-out, it is a cop-out on our part as agriculture leaders if we do not address macroeconomic policy. We all have to do it. There is nothing we can do in minor stabilization programs to redress the big things that are happening through an incoherent macroeconomic policy. I

am not pretending for a moment that we as one little interest group can change the macroeconomic policy, but I suggest that it is a cop-out if we do not try.

We got into the tripartite deal because of where we are today. That is why we now have less hope for its success than we once had. We had a chance; I would have given you an entirely different speech today, if the legislation had not been amended. I would have been able to tell you about the level playing field, about the restoration of a nationally uniform industry, with one market and winner-take-all, and with no possibility of countervail from the United States. I am no longer certain, Mr. Chairman, that we have a level playing field or that we can hope to get one in the near future.

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